HABITAT MANAGEMENT PLAN

BEAVER

San Bernardino National Forest

Forest Service • U. S. Department of Agriculture • California

AGRICULTURE—FOREST SERVICE—SAN FRANCISCO

00890

HABITAT MANAGEMENT PLAN

for

BEAVER

San Bernardino National Forest

1969

Prepared by
Jerome T. Light, Jr.
Wildlife Management Biologist

Recommended: _____ 5/7/69
Multiple Use Coordinator — Date

Approved: _____ May 7, 1969
Forest Supervisor — Date

_____ 5/5/69
Chief Division of Range & Wildlife R-5 — Date

OUTLINE

HABITAT MANAGEMENT PLAN FOR BEAVER IN THE SAN BERNARDINO NATIONAL FOREST

I. Introduction

The Forest Service is charged with the responsibility to maintain and manage the habitat of all forms of wildlife within National Forest boundaries. In preparing for this responsibility, Forest Service personnel must acquire a broad knowledge of the habitat requirements of all wildlife in order to adequately provide for them in multiple use management of the land.

Beaver is one of many of the wildlife species in the San Bernardino National Forest. They occupy and affect the flow of Southern California's most important resource - water. Since the beaver had been introduced, forest visitors as well as the local residents have come to enjoy their unique behavior. On the other hand, water companies, wildlife managers and land managers have been presented with many problems involved in managing beaver before they come in conflict with the important forest resources.

This habitat management plan is a product of a survey conducted by the Forest Service on beaver inhabited waters in the San Bernardino National Forest. The survey's objectives were to:

1. Determine the history and current status of the beaver in the San Bernardino National Forest.

2. Determine the quality and quantity of the habitat occupied by beaver.

3. Relate, by comparative analysis, the differences and similarities between the local habitat with areas where extensive research has been performed.

4. Research available documents for local history of beaver.

5. Determine methods and procedures for future (annual) recurrent surveys and management of beaver and its habitat.

The purposes of this plan are threefold.

1. Provide a media for tabulating a continuous status of beaver.

2. Provide a basis for coordinating State, Federal and private objectives involving the management of beaver and its habitat within the National Forest.

3. Provide a foundation for continuity in beaver habitat management with changing personnel.

II. History of Distribution

Prior to the Gold Rush, beaver in Northern and Central California and along the Colorado River were one of the most sought after furbearing mammals in California. Fur trappers came by sea and overland for their pelts. During this time there was considered to be three races of beaver native to California.[1] The races and their area of distribution were:

1. Shasta Beaver *(Castor canadensis shastensis)* Northern California

2. Golden Beaver *(Castor canadensis subauratus)* Central California

3. Sonora Beaver *(Castor canadensis repentinus)* Southeastern California

The beaver were naturally found in the large central valleys adjacent to the Sierra Nevada and Cascade Mountain Ranges and along the flood plain of the Colorado River. It is significant to point out that in natural distribution, beaver avoided the mountain streams and valleys and established themselves in the old flood plains of the Central Valley and Colorado River. This distribution is due to a number of factors which will be discussed in the following pages.

With the advance of the white man, beaver in California were nearly trapped to extinction for their valued pelts by 1911. Since then, the taking of beaver was generally prohibited until the 1950's when beaver trapping seasons have been allowed in some northern counties. Occasionally, permits are issued to take beaver where they are causing damage of significant nature.[2]

The mountains of Southern California apparently were never occupied by native beaver. Donald T. Tappe,[1] described the coast mountains (including Southern California) as too steep and rocky for beaver. This, combined with the arid climate, intermittent streams and flood plains, make most of the mountain watersheds of Southern California unsuited for beaver.

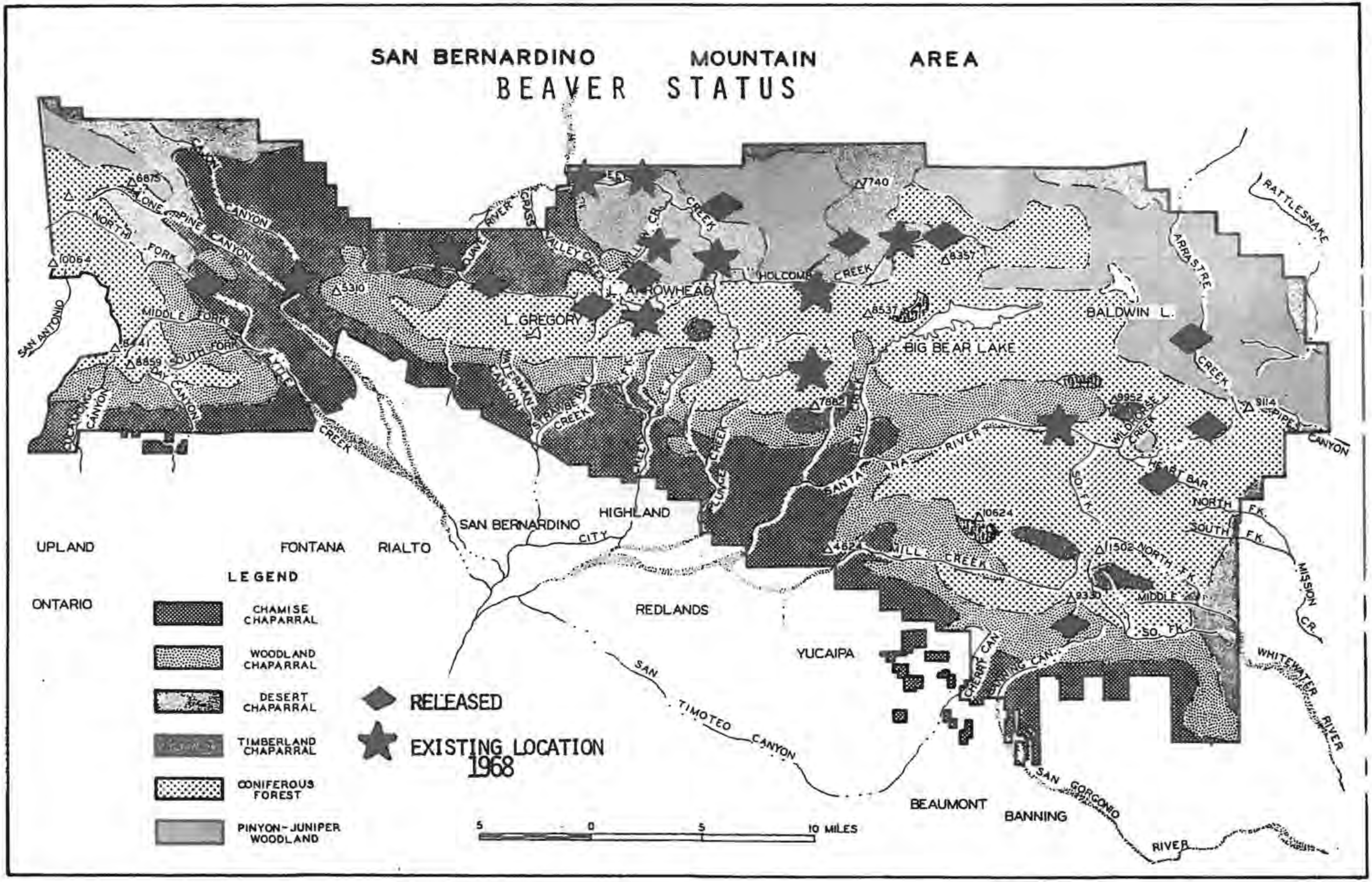
From 1945 to 1955, the Department of Fish and Game in cooperation with the local land owners transplanted 3,000 beaver into suitable waters in California.[2] It was during this period that beaver were introduced to Southern California. The objective of the beaver releases were to:

1. Improve trout stream habitat through creation of pools.

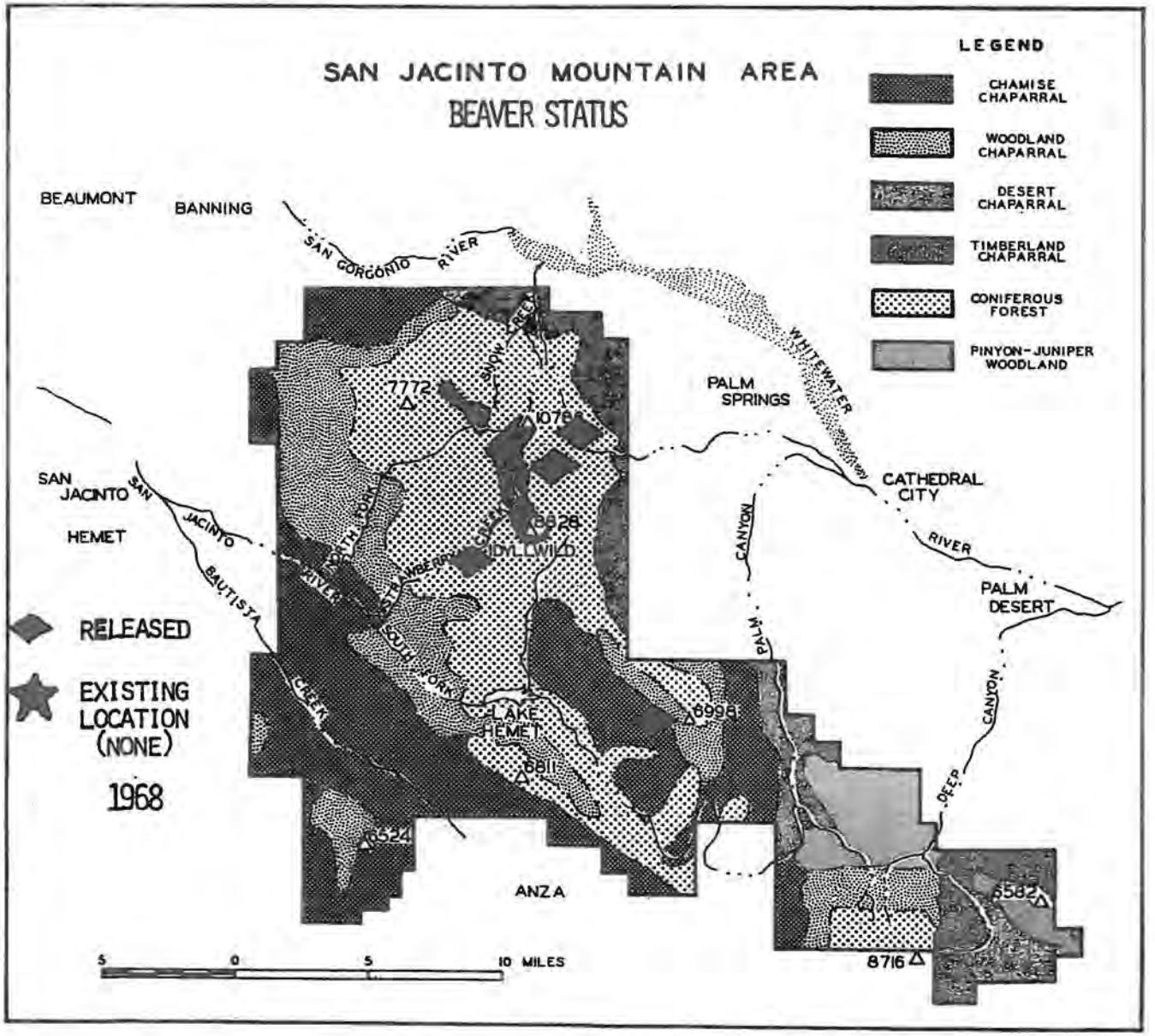
2. Improve and prolong trout fishing.

3. Provide an esthetic attraction for recreationists.

4. Stabilize water run-off and impound sediment near its origin.



SAN BERNARDINO MOUNTAIN AREA
BEAVER STATUS
LEGEND
CHAMISE CHAPARRAL
WOODLAND CHAPARRAL
DESERT CHAPARRAL
TIMBERLAND CHAPARRAL
CONIFEROUS FOREST
PINYON-JUNIPER WOODLAND
RELEASED
EXISTING LOCATION 1968
5 0 5 10 MILES
UPLAND
ONTARIO
FONTANA
RIALTO
SAN BERNARDINO
HIGHLAND
CITY
REDLANDS
YUCAIPA
BEAUMONT
BANNING
L. ARROWHEAD
L. GREGORY
BIG BEAR LAKE
BALDWIN L.
HOLCOMB CREEK
SANTA ANA RIVER
MILL CREEK
SAN TIMOTEO CANYON
SAN GORGONIO RIVER
WHITEWATER RIVER
MISSION CR.
RATTLESNAKE
ARRASTRE CREEK
PIPES CANYON
HEART BAR
NORTH FK.
SOUTH FK.
MIDDLE
SO. FK.
SAN ANTONIO
CUCAMONGA CANYON
DAY CANYON
LONE PINE CANYON
NORTH FORK
MIDDLE FORK
SOUTH FORK
WATERMAN CANYON
STRAWBERRY CREEK
PLUNGE CREEK
BEAR CREEK
CITY CREEK
WILDHORSE CREEK
CHERRY CAN.
LYTLE CREEK
CAJON CANYON
6875
10064
5310
8441
8859
7740
8357
8537
7882
9952
9114
10624
4624
11502
9330


SAN JACINTO MOUNTAIN AREA
BEAVER STATUS
LEGEND
CHAMISE CHAPARRAL
WOODLAND CHAPARRAL
DESERT CHAPARRAL
TIMBERLAND CHAPARRAL
CONIFEROUS FOREST
PINYON-JUNIPER WOODLAND
BEAUMONT
BANNING
SAN GORGONIO RIVER
SNOW CREEK
7772
10781
WHITEWATER
PALM SPRINGS
SAN JACINTO
SAN JACINTO
HEMET
SOUTH FORK
STRAWBERRY CREEK
8828
IDYLLWILD
CATHEDRAL CITY
CANYON
RIVER
PALM DESERT
BAUTISTA
CREEK
SOUTH FORK
LAKE HEMET
6881
6998
PALM CANYON
DEEP
6524
ANZA
6582
8716
RELEASED
EXISTING LOCATION (NONE)
1968
5 0 5 10 MILES

In 1945, golden beaver from Merced County were first released into the San Bernardino National Forest waters. A summary of these releases is in the Appendix. Approximately 82 beaver were released.

III. Current Status

At the time of the beaver releases in the National Forest, water flow in the streams was thought to be sufficient. Since then, however, the climate created periodic flash floods and a drying trend which climaxed (in 1961) in one of the worst droughts in many years. It is believed that the combination of flash floods and the prolonged drought eliminated the beaver from the San Jacinto Mountains by 1954. In the San Bernardino Mountains beaver ended up in only the perennial streams, rivers and lakes.

Recently (1965 & 1966), high velocity run-off from unusually high precipitation severely depleted the habitat for beaver in Deep Creek, Bear Creek, Cajon Creek and Santa Ana River.* In these areas beaver dams were washed downstream and the stream channels changed course or were silted in. In contrast, during the drought beaver activity was at its height in the perennial streams due to low peak run-off velocities.

IV. Major Problems

A. The natural topographic features of the San Bernardino Mountains are generally not well-suited for beaver occupancy. Continued success of beaver where they are presently located will depend primarily on future weather patterns and secondarily on intensive management of the animal and its habitat. The Forest objective will be to maintain existing soil, water and food components of their habitat primarily through coordinating other land uses.

B. Foresters and private land owners are aware but sometimes find it unrealistic to fully consider the effects that road construction, building construction, recreation site preparation and logging have on water quality and on beaver habitat.

C. Beaver, in their quest for suitable habitat often come in conflict with other users of the water resource; namely, municipal water companies, road departments, private landowners on lakes, and recreation area developments.

D. Field Foresters need a sound method of determining beaver habitat conditions and carrying capacity if they are to report on beaver habitat problems and beaver management needs.

*As of this writing, the severe floods of January and February 1969 have damaged almost all of the beaver habitat on the forest.

E. Special areas requiring management consideration are as follows:

1. In the Santa Ana River, beaver provide a high esthetic recreational value as expressed by local visitor interest. The river on the other hand is generally not well-suited for beaver. It has been found that beaver cause watershed damage (bank cutting, changes in channel, etc.), riparian vegetation loss (consumed and flooded) and water loss due to evaporation in ponds (Bear Valley Mutual Water Company). If beaver are to be maintained as an esthetic resource in this river, watershed and vegetative damage must be kept to a minimum by control of beaver numbers.

   Environmental resistance imposed by the high water flows in the Santa Ana River may provide the necessary control (mortality of young) on beaver numbers due to the timing of high run-off with the seasons of mating and rearing of young.

2. Beaver in the Holcomb Creek have sustained themselves in the upper portion of the watershed since they were released. In contrast with the Santa Ana River beaver, watershed relationships are compatible as shown by limited damage to watershed and vegetation. The good trout fishery found in the upper reaches of Holcomb Creek is a by-product of this compatible relationship.

3. Dispersal of young and old beaver, due to overpopulation and environmental resistance, from the main area of occupancy to other watersheds has in some cases created administrative problems involving the Forest Service, California Department of Fish and Game and private landowners. Examples are shown below.

Main Area of Occupancy	New Location	Problem
Holcomb Creek	Hanna Flat	Road washed out
Deep Creek	Arrowbear Lake	A) Road closed B) Vegetative damage C) Flooding D) Scenic damage E) Threatened dam site

   Stabilization of the main beaver populations will reduce dispersals and decrease such problems.

V. Current Condition of the Habitat

The condition of the beaver habitat was determined through analysis of the characteristics of three basic limiting factors, topography, water

and food. The analysis showed that certain variations in the characteristics of these factors resulted in either success or failure of beaver colonies and in maintenance or depletion of beaver habitat.

A. Topography

This plan has employed the standards (with local modification) for determining beaver habitat suitability developed by William H. Rutherford, of the Colorado Game, Fish and Parks Department.(3) See Table I in Appendix.

The San Bernardino mountain uplift is of relatively recent origin and is characterized by young topography. The main features are deep narrow canyons and sharp and steep ridges resulting from steep slopes and the irregular and intense rainstorms which are typical of the coast range. Although Tappe (1) states that this factor may not be limiting to beaver, it nevertheless does limit beaver productivity through environmental resistance.

The topographic characteristics of the Forest watersheds probably exert far more influence on beaver occurrence than do water or food. These characteristics consist of (a) rocktype, (b) valley grade, (c) valley width, (d) extent of watershed, and (e) erosion.

Rock Type - The San Bernardino Mountains' geological substructure is predominantly granite in rapid natural decomposition. The resultant residue, decomposed granite (commonly called "D. G.")is easily transported by moderate velocity water flows to settle behind such obstructions as beaver dams. Even under good watershed conditions a high rate of natural sedimentation can and should be expected. Past road construction methods (since modified to prevent soil erosion) on timber sales such as those in the Heart Bar and Lower Holcomb Creek have contributed to the high sedimentation and destruction of beaver habitat.

The San Bernardino mountain beaver habitat would rate as "poor" for rock type due to annual silting of beaver ponds. (5)

Valley Grades - Beaver exist best in the three to ten percent gradient valleys in the San Bernardino National Forest. The mean valley grade is six percent. This would be classified as "excellent" according to Rutherford's suitability standards. (3) However, Rutherford's study points out that beaver occupancy is greatest in the one to two percent valley grades. In Colorado such grades occurred behind mountains produced by glacial deposits and behind rock dikes.

In the San Bernardino Mountains, low gradient valleys are found behind rock dikes and rock avalanches (Slide Lake). The streams in such valleys are or were formerly occupied by beaver colonies.

Valley Width - The valleys occupied by beaver in the San Bernardino National Forest vary in width from channel size to 150 feet wider than the channel. The average valley width on this Forest falls in Rutherfords' "fair" suitability class. During high run-off, valley width is unsuitable for beaver throughout the entire Forest.

In the Colorado Rockies some beaver colonies were found in "V" shaped valleys; but most were found in the "U" shaped valleys. There are no U-shaped valleys in the San Bernardino Mountains.

Extent of Watershed - The breadth and steepness of the upstream watersheds with their influence on the volume and velocity of water flow is probably the single topographic characteristic most affecting the disposition and productivity of beaver in the San Bernardino Mountain watersheds. Table II (in Appendix) rates this topographic characteristic and its effects on beaver habitat in the San Bernardino National Forest.

In summary, Table II indicates that beaver habitat suitability is "good" if the upstream watershed is not more than 5,000 acres with gentle slopes or 3,000 acres with moderate slopes.

Erosion - Because of the steep and extensive watersheds, water run-off volume and velocities are such that low gradient valley channels are not able to contain the water flow during run-off periods. Upstream erosion, natural and man-caused, has added a sediment load to the flood waters. As a result, beaver dams with the above situations are silted in or left high and dry by stream channel changes.

B. Water

Water in considerable volume is a major requirement for survival of the beaver. Beaver will inhabit natural (lake) water impoundments, but in most cases the beaver builds its own impoundment where food is in sufficient quantity.

Prior to the first beaver introductions, annual precipitation in this part of California was above normal and provided stream flows sufficient to yield suitable beaver habitat. Since 1947, yearly annual precipitation has dropped to produce a prolonged drought which was most severe in 1961. The disappearance of beaver planted in San Jacinto Mountains could have been caused by destructive flash floods, deposition of sediment behind the dams, and beaver dying in the winter from lack of cover and food as well as from migrating into the desert in search of water as a result of the drought. Numerous streams in the San Bernardino Mountains dried up leaving beaver without water. In the perennial streams (Santa Ana River and Upper Holcomb Creek), beaver activity is still abundant and was found to be as follows in the Santa Ana River:

Annual Precipitation - Beaver Activity in Santa Ana River

Water Year* (ending in)	Annual Rainfall (Del Rosa)	Number of Dams
1960	15.66	28
1961	6.92	17
1962	18.95	17
1963	15.42	10
1964	14.88	16
1965	18.02	11 (9 beaver removed)
1966	23.44	3
1967	39.08	2
1968		4

*(From October 1 through September 30)

C. Food

The low gradient valleys (Santa Ana River, Holcomb Creek, etc.) provide the riparian or willow vegetative types which provide the basic food and dam construction materials for beaver in the San Bernardino National Forest.

Beaver are entirely vegetarians and subsist chiefly on the bark or wood of twigs, branches and tree trunks, (Seymour [2] and A. C. Martin [4]). Woody plants such as Willow (*Salix* Sp.) and Cottonwood (*Populus Trichocarpus*) are preferred. Water Lily (*Liliaceae* Sp.) and other aquatic plants and woody plants (Pine, Alder, Pinyon, Chamise, etc.) are eaten when beaver are hard pressed to fill out their diet.

The most preferred food for beaver in the National Forest is the willow. Where beaver are out of balance with food supply, the willows are the first plants that are damaged or destroyed. When this happens, the beaver usually abandon the dams to find another suitable willow site. If the willows around abandoned dam sites resprout the site may once again be occupied by beaver. A good example of this is shown in the site occupied by the Old Camp Osceola beaver colony. This colony has moved back and forth

throughout this large stand of willows for many years.

The Old Camp Osceola beaver colonies have used or otherwise affected (flooded or eroded) all of the willow in the area. Trees (cottonwood, incense cedar) near this area of beaver activity have died and 40 percent of the willow stand is becoming decadent due to flooding. The apparent trend appears to be downward in the Old Camp Osceola areas (1968).

The Upper Holcomb Creek habitat has been occupied by beaver since their release in 1947. The willows are well established and appear to resprout sufficiently to allow the habitat to remain in at least a static trend. Flooding of the willow is not common in this area and therefore does not hinder sprouting.

In the Willow Creek drainage beaver activity is restricted to one area. The food supply (willows) has long since become insufficient to support more than a few beaver. Willows should be re-established here if beaver are to remain.

A method for determining beaver carrying capacity of the riparian vegetative type in the Forest is outlined in the Procedures, Section X. Table 3, (in Appendix) includes the Estimated Carrying Capacity of the beaver habitats within the Forest that were determined from this method.

VI. The Beaver

Life Story

In the San Bernardino Mountains the beaver begins to build or repair their dams during the spring. During the fall and early winter these dams are usually washed out or silted-in as a result of heavy run-offs. This disruption causes conflicts with the beaver's mating season which begins in February. If breeding is successful, 2 to 6 young, called kits, are produced by the end of May. The kits remain in the colony for two years, then are driven out from their home colony by their parents prior to the February mating season. The kits may seek a suitable site adjacent to the parent colony or they may travel up to 30 miles in search of a companion to settle with. The beaver mates during its third year. Sexual maturity is usually not reached until the end of the third year. (2)

A beaver colony is defined here as being made up of two adults, the young (1-6) of the year, and the young 1-6) of the previous year. (2) The average number in the colony is usually 4 beaver (2 adults, 1 kit, 1 yearling). The territory of the colony is from the center or beaver lodge to the surrounding food (willows). Usually the territorial boundary is not more than 100 yards from the lodge. Rutherford claims that beaver will not go further than 100 yards for food.(3) If food becomes short within this distance, they will abandon the dam in search of a new site.

Dam Construction

In the San Bernardino Mountains the beaver makes a hole in the stream bank for his temporary home prior to the construction of the primary beaver dam and lodge. Secondary pools (linked by canals) and slides (to transport dam materials) are then constructed. The center of activity is the lodge where food is stored for the winter.

Basic materials used in dam construction by the beaver in the San Bernardino Mountains are rocks or logs with diameters up to 8 inches with limbs and twigs of willow, alder, cottonwood and other trees backed up with mud, aquatic weeds and stream bank sod.

Mortality Factors

The lodge and the aquatic habitat, in general, help to protect the beaver from natural enemies such as coyotes, bobcats and mountain lion. The young of the year are most susceptible to predation. They usually are not taken except when on the mainland. (3)

Beaver have come in conflict with other uses in the National Forest and beaver populations have been reduced in the Santa Ana River, Arrastre Creek, Banning Creek and Hanna Flat as a result.

Rutherford (3) states that though evidence is lacking, it is believed that any flood which causes severe habitat disruption also takes its toll of young beaver through drowning. Beaver activity was reduced considerably after the 1965 and 1966 floods in Slide Lake and Santa Ana River. These floods may have caused this reduction by direct mortality as well as by restricting reproduction.

When streams dry up during drought years, this leaves beaver to find new pool sites or to perish. Those that descended into the Colorado Desert from the San Jacinto Mountains and the Mojave Desert from Arrastre Creek probably did not survive. There is no evidence of beaver activity in any of these streams at the present time.

Flood and drought conditions also make beaver more vulnerable to their natural enemies.

VII. Condition of Habitat of Fish and Other Wildlife

A. Fish

Beaver colonies in Upper Holcomb Creek appeared to provide a sustaining trout fishery. The beaver sites that were found suitable by Rutherford's classification did sustain trout. The beaver dams of the Upper Holcomb Creek do not appear to prevent migration and spawning of trout. Trout spawn in the ponds in Upper Holcomb Creek.

Rasmussen [6] points out that beaver ponds produce microscopic organisms suitable as food for small fry and fingerling trout production. Numerous trout fry and fingerlings were found in the beaver ponds of Upper Holcomb Creek.

Beaver sites that fell into fair and poor suitability classes detracted from the quality of the trout fishery. The frequent destruction of dams in the Santa Ana River with its unstable flood plains reduces the quality of the downstream trout fishery with silt and debris. The Deep Creek watershed sustains a trout fishery because of its many natural pools which provide cover and aquatic foods. Except for eliminating riparian vegetation, beaver had no apparent effect on the trout fishery in Deep Creek. Fall water run-off in 1965 and 1966 piled beaver dam debris 3 to 10 feet above the normal stream channel of Deep Creek.

VIII. Objectives

Following are the principal objectives of this plan.

A. Maintain and manage beaver where they exist to benefit fisheries, other wildlife, recreation and esthetic values without jeopardizing the downstream water quality.

1. By balancing beaver numbers with habitat capacity.

   Areas of occupancy should be assessed annually for beaver habitat carrying capacity and current population. Surplus beaver should be removed as necessary and possible. Beaver colonies in poor habitats should be discouraged if they detract from the quality of water or cause significant soil disturbance.

2. By habitat management

   Certain potentially suitable areas lacking food (Willow Creek - Arrowhead) should be managed to encourage future reoccupation by beaver.

B. Increase the knowledge of San Bernardino Mountains beaver biology and ecology.

1. By encouraging research.

2. By participating in censuses of all beaver areas in the National Forest.

3. By cooperating with other groups and agencies in the management and research of beaver and its habitat.

C. Coordinate beaver habitat management with other land use management.

1. Range Management. Use of beaver habitat (willows) by browsing livestock detracts from the habitats' carrying capacity for beaver. Livestock grazing should be closely regulated in the riparian woodlands occupied by beaver.

2. Recreation Management. Consideration should be given to providing self-guided nature walks with blinds for night viewing through suitable occupied beaver habitat. Future recreation camp sites should be developed at least a 100 yards from the channel of beaver occupied streams.

3. Timber Management. Future road construction in Santa Ana River, Holcomb Creek and Deep Creek watersheds should be designed so as not to cause significant soil losses in these watersheds.

4. Watershed Management. Watershed protection is the major land management objective of the San Bernardino National Forest. For this reason intensive management must be directed toward maintenance of channels for water conveyance. Heavy debris or sediment deposition in these channels resulting from beaver occupying unsuitable habitat will detract from this management objective.

5. Wildlife Management. Trout-beaver habitat relationships should be surveyed annually and maintained in proper balance as necessary where beaver inhabit suitable trout habitat. Proper management of beaver habitat will favor waterfowl, other water birds and fur bearing mammals, and thus increase the carrying capacity for wildlife in the area.

6. Land Use. Past land use (timber sale roads, highway construction, real estate developments) on private as well as National Forest land have affected the quality of beaver inhabitated streams. Examples:

   Deep Creek - Dams and Urban Development

   Holcomb Creek - Past logging

   Santa Ana River - Past logging

   Willow Creek - Past sewer pond development

   Fisheries have been most severely affected. Foresters (as well as private landowners) should be aware of the damage that can be caused by poorly planned activities and the effect on the quality of watersheds and their water conveyance channels.

IX. Responsibilities

A. U. S. Forest Service

1. Forest Supervisor and Staff:

Responsible for planning measures affecting the enhancement and maintenance of habitats for wildlife species. Evaluates District Rangers' proposals for wildlife habitat improvements. Requests funds from R.O. and allocates project funds to ranger districts for wildlife habitat improvements.

2. Wildlife Management Biologist:

Responsible for technical assistance to the Forest Supervisor and staff and to the District Rangers when called upon.

3. District Rangers:

The principal land managers on the National Forest. They are responsible for carrying out all action programs.

B. California Department of Fish and Game:

1. Changes in general trapping regulations by the Fish and Game Commission under Fish and Game Code Section 4182. This method is recommended only where there is wide spread depredation by beaver. This code authorizes zoning the area of depredation and trapping by the State.

2. Depredation permits under Fish and Game Code Section 4181. This method is recommended for relieving beaver damage in small local situations. Landowners with property being damaged by beaver may be issued a permit to kill the beaver if there is evidence of beaver damage. The landowner will be instructed in beaver trapping techniques by the Department of Fish & Game if necessary or desired by the landowner. Department of Fish & Game personnel are not authorized to destroy beaver.

3. In special situations, beaver can be live trapped and transplanted to suitable locations, upon authorization of the Deputy Director of the Department of Fish & Game in order to provide for control of depredation and damage. Live trapping and transplanting is rarely recommended since the problem is often only transplanted from one area to another.

C. Cooperators

1. The San Bernardino County Fish & Game Commission has recognized that beaver, especially in the Upper Holcomb Creek, are of value not only for esthetic recreation purposes but as enhancers of fish habitat.

2. The Bear Valley Mutual Water Company of Redlands is a co-sponsor of the Upper Santa Ana watershed agreement of 1961, with the Forest Service and the California Department of Fish & Game. Under the agreement, the Department of Fish & Game is responsible for the removal of surplus beaver in the Santa Ana Drainage when the annual inspection indicates there are more than eight primary beaver dams. This is the only case in the San Bernardino Mountains where the Department has the responsibilities for controlling beaver dams.

X. Procedures

A. Job Standards

Future land treatment projects affecting any watershed will be given full multiple use review.

Beaver populations will be brought into balance with carrying capacities in the following areas in order to maintain watershed quality and other multiple use values.

Locality	Recommended No. of Colonies	Affected Land Values
Santa Ana (Old Camp Osceola, Convict, Big Meadow)	2	1. Flooding of roads. 2. Limited food supply 3. Recreation area value. 4. Killing vegetation.
Upper Holcomb Creek	2	1. Static food supply. 2. Many abandoned dams detract from quality of site and water. 3. Good recreational value.
Lower Holcomb Creek	Phase Out (5)	1. In conflict with mining activity. 2. Water run-off too great. 3. Siltation is above normal.
Arrowbear Lake (private)	Phase Out (1)	1. Beaver in conflict with urban use of land. 2. Insufficient food.
Deep Creek (Devils Hole, Mill Creek & Luna)	1	1. No problem.

Locality	Recommended No. Of Colonies	Affected Land Values
Warm Springs	0	1. No problem.
Flume	0	1. Conflicting with operation of flume.
Lake Arrowhead	Phase Out (2)	1. In conflict with urban use of lake and valued riparian vegetation.
West Fork Mojave	Phase Out (1)	1. Area to be inundated by Cedar Springs Reservoir.
Willow Creek	2	1. Food supply limited. 2. Sedimentation above normal due to upstream land treatment. 3. Water of poor (polluted) quality.
Cajon Creek	1	1. Little problem.

B. Surveys

A knowledge of the current status of beaver in the San Bernardino National Forest is a necessity due to the high demands for the many resources of the Forest.

The survey procedures that follow are designed to provide the Forester with the necessary tools to evaluate the status of beaver productivity and of beaver habitat conditions.

Population

Census - Count one colony for every two associated primary dams or for each lodge or bank burrow.

Productivity - (Adults to young) - Tooth marks less than 1/4 inch in width indicates presence of yearling and young of the year. Look for the diversity of tooth-mark sizes. The presence of three different sizes may indicate that colony includes both kits and yearlings.

Class	: Adults	Yearlings	Kits
Width of Toothmarks	: 1/2 - 1/4"	1/4"	1/8"

Habitat Condition

Food

Capacity of willows. Are willows reproducing - satisfactory, unsatisfactory, decadent? Is less palatable vegetation being eaten?

Stream Valley

Is valley wider than channel?
Is channel eroded?
Has water table been lowered?
Is there bank cutting?
Is sedimentation above normal?

Other Conflicts

- Road culvert plugged?
- Access to homesite cut off?
- Valuable tree cut down?
- Lake water -level rising?
- Sedimentation high due to upstream land treatment (logging, roadwork, etc.)?
- Run-off damage - bank erosion and channel changes?

CARRYING CAPACITY DETERMINATION METHOD

The following method consists of three steps to determine the approximate beaver carrying capacity of each unit area.

Food Source	Acres of Willow per Colony Condition Classes		
	Good	Fair	Poor
Willow	12 acres	18 acres	25 acres

The three condition classes are described as follows:

Good - The stand of willows are tall (over 6'), crowns are closed, and sprout vigorously.
Fair - The stand of willows are of medium height (below 6'), crowns are not touching, and sprout with moderate vigor.
Poor - The stand of willows are low growing, crowns are considerably open, and the majority of the stand is in decadent condition (as a result of past flooding, over-

clipping by beaver or undermining).

1. Determine the total number of acres and condition class of willow types in each area occupied by beaver.

2. Deduct from the total acreage of willow the following percentages:

Deduct =	Description
0%	All the willow stand is available as a result of no past use or erosion damage. Generally associated with good condition class.
25%	About 75 percent of the willow stand is available; willows show light to moderate use (beaver, deer or livestock). Erosion damage is usually absent. Generally associated with a Good to Fair condition class.
50%	About 50 percent of the willow stand is available; willow shows moderate use by beaver. Erosion damage is evident. Associated with Fair condition class.
75%	About 25 percent of the willow stand is available; willow shows moderate to heavy use. Erosion damage occurs annually. Willows are becoming decadent. Associated with Fair to Poor condition class.
100%	None of the willow stand is available. Erosion and over-use of willows had rendered the willows decadent with few sprouts. This generally results in channel changes. Poor condition class.

3. Determine beaver carrying capacity of each area as follows: (Acres of willows - % Unavailable) ÷ Acres per colony = Number of colonies). Based on the above method, the carrying capacities for beaver of the various occupied streams on the Forest are shown in Table III in Appendix.

   The survey should be carried out annually in October or prior to the fall rains. (Use Form 12-2600-6).

C. Financing

Project work proposals designed to enhance beaver habitat conditions and/or cleanup after beaver dam abandonment should be submitted to the Supervisor's Office in late November or early December.

Cooperative assistance from County Fish & Game Commission or local youth groups may be used to advantage in some classes of projects.

XI. Action Plan

A. District Rangers

1. Conduct beaver surveys annually and document findings as an addendum to this plan.

2. Provide a self-guided tour for recreationists to show beaver activities in Upper Holcomb Creek and Santa Ana River.

3. Analyze the needs of each occupied beaver site. Clear debris from old abandoned dam sites and/or plant willows to strengthen the stream channel and encourage beaver occupancy in watershed treatment projects.

B. Wildlife Biologist

1. Work with the District Rangers in developing the beaver survey procedures. Evaluate the effectiveness of the survey method.

2. Assist the District Ranger as needed to meet the objectives of this plan.

3. Work with the State to assess needs for beaver control.

C. Forest Supervisor and Staff

Design and publish a beaver pamphlet for public handout as a Visitor Information Service.

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APPENDIX

BEAVER

WILDLIFE SERIES LEAFLET NO. 1

HABITS

The beaver is most important to man because of his habit of building dams which hold back water. Such dams help prevent topsoil from washing away. They also provide deep-water ponds in which beavers can build houses and live safely. Some beavers build houses of sticks and mud which form little islands. Others burrow into a bank. Beaver houses usually have two or more underwater entrances.

When a beaver hears a strange noise he slaps his tail on the water as a warning to other beavers in the pond. He is a fast, graceful swimmer, but on land he is slow and clumsy. His sharp front teeth are good weapons, but he prefers to run rather than fight.

Beavers are almost never seen in daylight hours. Most of the work of building and repairing dams and gathering food is done at night. Cutting a large tree may take several nights of work, and more than one beaver may help in cutting down a tree and dragging branches into the water. Beavers have cut down cottonwood trees more than three feet thick.

Although beavers breathe air like people, they can stay under water for more than ten minutes. Valves in the ears and nose close when the beaver dives under water and open again when he comes up. The lips are so loose they can be closed tightly behind the front teeth. In this way a beaver can cut and chew under water without getting water in his mouth.

Young beavers usually leave home when they are about two years old. They begin looking for mates and soon start new colonies. Rivers and streams serve as highways for travel, but sometimes a beaver will wander over the hill and down into the next valley in search of a new homesite.

MANAGEMENT

Beavers became scarce in Oregon because of overtrapping. After they were given protection by closed trapping seasons, they began to increase, first along the lower Columbia River. The damage they caused to dikes and canal banks made it necessary to live-trap them and move them to new homes. By this method beaver were soon placed in nearly every part of the state.

By 1950, surpluses of beaver were observed, and damage to crops became common. An open season for trapping was set so that trappers could harvest the beaver crop. Some national forests and headwaters of streams are closed to protect breeding stock for replenishing areas open to trapping.

To prevent overharvesting special regulations are in effect. In addition to a trapping license each trapper must have a tag to put on each beaver he catches. The number of beaver tags sold to each trapper is limited. Trappers must report their catches at the end of the season. They are encouraged to learn how to prepare the pelt to get the highest price from the fur buyer.

Field agents of the Game Commission make surveys after each trapping season to see if there are enough animals left to renew the supply for another season. As a result of good management, which includes proper harvesting, beavers will always be a valuable part of Oregon's wildlife resources.

Information—Education Department
OREGON STATE GAME COMMISSION
Portland, Oregon

15M-1959
15M-1963

BEAVER

East of the Cascades beaver build lodges in the pond formed by dams. In western Oregon their homes are in stream banks.

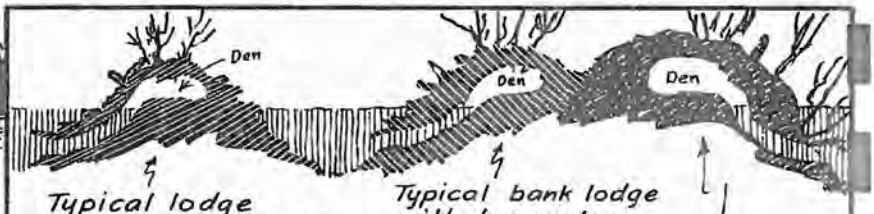
Beaver are heavily built, round-bodied animals, with powerful chisel-shaped front teeth, short legs, fully webbed hind feet and a flat scaly tail.
They are covered with long coarse guard hairs overlying the short dense, silky underfur.

Humanlike forepaw

Split nail of second toe is used to comb fur.

Favorite foods are aspen, cottonwood and willow; the bark, leaves and twigs being eaten. Barks of other trees, herbs and grasses are important in the diet.

Bear frequently destroy lodges to catch the young.

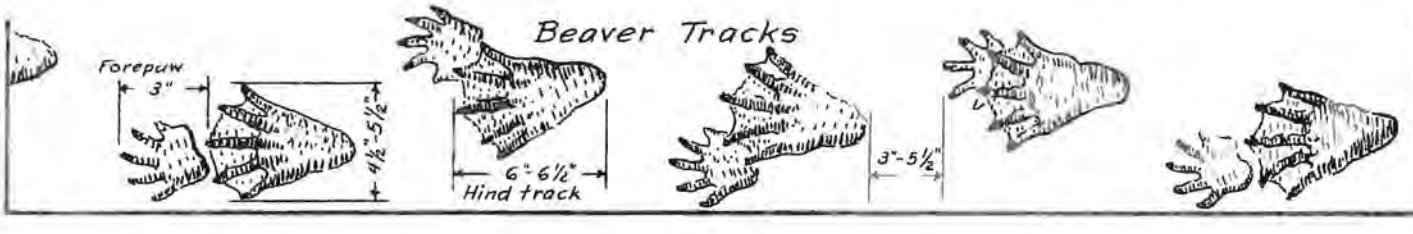


Typical lodge behind a beaver dam, usually two under water entrances.

Typical bank lodge with two under water entrances.

Beaver burrow dug in a stream bank.

Beaver Tracks



Beaver

The beaver is the largest member of the rodent family in North America. It is the only wild animal that actually changes its environment to suit its needs. It cuts trees, both large and small, and builds dams to impound water in which to live. It also digs canals to transport food and building materials when the supply of trees near water is exhausted.

The beaver is a large animal. Adults average from 30 to 40 pounds each, with some individuals growing to 100 pounds. Its head is massive and its large, orange-colored incisors are well suited to gnawing. Its eyes are small and its little ears are nearly hidden in its dense fur. The beaver's body is plump and covered uniformly with rich, brown fur. Its large hind feet are webbed and it has a large, flat, hairless paddle-shaped tail.

The beaver is semiaquatic and needs a continuous supply of water in which to live, with available food nearby. Water several feet deep is required for escape to safety. Whenever a beaver chooses to live near shallow water, it builds dams to impound the water. Some of the dams may be 200 or 300 feet long and 8 feet high.

Along deep rivers and sloughs, the beavers prefer to live in dens they dig themselves in the banks along the water. They sometimes build homes or lodges in small rocky streams or shallow waters. A beaver lodge may be 15 feet across and 6 or 8 feet high. Like the dams, it is also built of limbs, mud, tules, cornstalks or other easily available materials.

The beaver always provides for its home an underwater entrance which leads up to a chamber above water level.

The beaver feeds on the bark and tender twigs of water-loving trees like willow, cottonwood and aspen, and it also likes roots, bulbs, grasses and tules.

Beavers do not hibernate, but in cold weather they stay in their homes for days, subsisting on food which they have stored. An eager beaver may come out in daylight, but for the most part, cutting and building is done at night.

Each lodge contains a family of beavers—the young of the year and the young of the previous year. When the young are approaching their second year, they are driven out to start a colony of their own. This is nature's way of dispersing this species.

The mating season commences in February and most litters are born in April and May. The mother has only one litter a year and there is an average of four kits to the litter.

This baby beaver was captured, along with a number of adults, in a transplanting operation carried out by the Department of Fish and Game. His cuteness won lots of friends on his trip, but he was happiest when he was released with his parents into his new home.

Although there is only one species of beaver, there were three geographical variations . . . the Sonora beaver along the Colorado River, the Golden beaver in Sacramento and San Joaquin Valleys, and the Shasta beaver in Northern California. They were trapped nearly to extinction by the end of the 19th century. In 1911, the season was entirely closed and for the next 35 years the season was kept closed, except for beavers that were permitted to be taken in areas where they were interfering with agriculture.

From 1945 to 1955, the Department of Fish and Game transplanted 3,000 beavers into all the suitable waters in California. Today beavers may be found in suitable waters throughout the State and up to 9,000 feet elevation in the Sierra.

The beaver ranks second in economic importance to the muskrat in the California fur trade. Approximately 1,600 beavers were reported taken in 1962-63.

Beavers far removed from agriculture still have a high esthetic value. The operations of a successful beaver colony, with its series of dams, is one of nature's wonders. In a restricted area like a small valley, beavers soon multiply beyond the carrying capacity of the valley. If they are not reduced sharply in numbers each year, they soon eat themselves out of house and home by cutting all the suitable trees, and the regrowth is utilized faster than it can be replaced. The beaver must then immigrate. When they leave the safety of their homes, beavers become subject to disease and predation, or they end up in waters that are being used by man. Their depredations cause them to be looked upon by agriculturists as undesirable rodents. This whole cycle takes place in a few short years.

Prepared by George Seymour
Supervisor Conservation Education
California Department of Fish and Game

This article is one of a series printed by the Department of Fish and Game. Single sheet reprints may be obtained from the Department, 1416 Ninth Street, Sacramento 95814. Bulk quantities may be purchased from Documents Section, P.O. Box 20191, Sacramento 95820, for the following prices: 100 or more—$2 per hundred, 1,000 or more—$1.90 per hundred, 5,000 or more—$1.75 per hundred (California residents add 4% sales tax). Information on California's wildlife also is available from the National Audubon Society, Conservation Resource Center, 2426 Bancroft Way, Berkeley 94704.

STATE OF CALIFORNIA • H RESOURCES AGENCY • DEPARTMENT OF FISH AND GAM
Reprinted From the May 1964 Issue of *Outdoor California*, the DFG Monthly News Magazine

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PROBABLE FORMER RANGE OF SHASTA BEAVER, CASTOR CANADENSIS SHASTENSIS
2
PROBABLE FORMER RANGE OF GOLDEN BEAVER, CASTOR CANADENSIS SUBAURATUS
3
PROBABLE FORMER RANGE OF SONORA BEAVER, CASTOR CANADENSIS REPENTINUS
INTRODUCTION OF SHASTA BEAVER
INTRODUCTION OF GOLDEN BEAVER
INTRODUCTION OF IDAHO BEAVER CASTOR CANADENSIS TAYLORI
INTRODUCTION OF OREGON BEAVER
SHASTA BEAVER TRANSPLANTING FAILURE
DISTRIBUTION MAP
MUSEUM OF VERTEBRATE ZOOLOGY
UNIVERSITY OF CALIFORNIA

TABLE I

Physical Suitability

Transplantability	Unsafe		Safe	
Suitability	Poor	Fair	Good	Excellent
Grade (%)	16	13 - 15	7 - 12	6 - 0
Valley Width	Channel	Channel	To 150'	150' +
Rock (Parent)	Schist Granite Rhyolie Shale	Schist Granite Rhyolite Shale	Schist Granite Rhyolite --	Schist Granite -- --
Erosion	Flood Plain	Flood Plain	--	--

A. Watershed Condition - Physical condition upstream

B. Land Use - Private, timber, grazing, wildlife, etc.

C. Physical Factors Restraining Beaver Occupation:

1. Steep uplands
2. Narrow Flood Plain
3. Large watershed upstream
4. Eroding, rocky channel
5. Heavily wooded and shaded areas

TABLE II

Topographic Characteristic

Location	Acres Upstream Watershed	Upstream Topography	Habitat Suitability	Disposition of Beaver
Old Camp Osceola-Santa Ana River	18,000	Steep slopes	Poor	Dams are either washed out or silted-in annually. Flood plain. Static existence of beaver.
Upper Holcomb Creek	4,000 5,700	Gentle to moderate slopes	Good	Beaver existed and multiplied in area since planted. Channel is stabilized.
Lower Holcomb Creek	5,700 - 12,000	Moderate to steep slopes	Fair	Static existence of beaver. The channel is rocky. The dams either washed out or silted-in annually.
Slide Lake Bear Creek	11,500	Steep	Poor	Beaver dams destroyed annually.
Devils Hole-Deep Creek	48,000	Steep	Poor	Beaver dams washed out biannually. Static existence of beaver.
Warm Springs-Deep Creek	64,500	Steep	Poor	Beaver dams washed out biannually. Static existence of beaver.
Flume Deep Creek	83,300	Steep	Poor	Beaver dams washed out biannually. Static existence of beaver.
Willow Creek	6,000	Moderate	Good to Fair	Arrowhead Lake influences water flow. Water quality problem. Static existence of beaver. Beaver dams washed out or silted-in annually.

TABLE II

Topographic Characteristic
(Continued)

Location	Acres Upstream Watershed	Upstream Topography	Habitat Suitability	Disposition of Beaver
West Fork Mojave River	16,000	Moderate to Steep	Fair	Beaver dams washed out annually. Static existence of beaver.
Lakes, Arrowhead and Arrowbear	-	Flat	Good	Food and competition for space are the limiting factors.
Cajon Creek	18,000	Moderate	Poor (Flood plain)	Dams are washed out periodically and food supply scoured from flood plain.

TABLE III

Estimated Carrying Capacity

Area	Acres Willow	Unavail-ability	Adjusted acres	Condition Class	Estimated Capacity (No. of Colonies)
Willow Creek					2
Jeep Xing	24	50%	12	Fair	(1)
Old Sewer Ponds	50	75%	13	Poor	(1)
Santa Ana					2
Convict Flats	30	75%	7.5	Poor	(0)
Old Cp. Osceola	40	50%	20	Poor	(1)
Big Meadow	40	50%	20	Fair	(1)
Holcomb Creek					5
Upper	42	25%	32	Fair	(2)
Lower (A)	60	75%	15	Poor	(1)
(B)	28	50%	14	Poor	(1)
(C)	60	50%	30	Poor	(1)
Lower Deep Creek					1
Flume	15	50%	7	Poor	(0)
Warm Springs	22	75%	5.5	Poor	(0)
Luna	48	50%	24	Poor	(1)
Mill Creek	30	75%	7.5	Poor	(0)
Devils Hole	45	75%	11	Poor	(0)

The estimates are based on acres and conditions determined during the beaver surveys. These estimates may require refinement in future surveys.

WILDLIFE EXTRACT

2630

U.S. FOREST SERVICE REGION 5

San Francisco, California

November 10, 1964

BEAVER HABITAT MANAGEMENT*

The factors that make habitat suitable for beaver are water, topography, and food supply. Water in considerable volume is a major requirement. In some cases beaver are found in natural ponds, lakes, or rivers where the amount of water is sufficient for their needs. In more cases the beaver must build dams in order to have water in sufficient quantity. Usually only one dam (the home dam) is built to provide the impoundment for the main lodge. Secondary dams may be built, along with ditches and canals, to aid in transportation of food to the main pond.

Topography

Four beaver site suitability classes have been developed in Colorado to assist in evaluation of the topographical factors in beaver habitat.

1. Excellent - Valley grade: 0-6 percent; improves with decreasing grade. Valley width: Wider than channel and generally wider than 150 feet; improves as width increases. Rock type: glacial till, schist, granite, in that order. Management requirements: This classification requires minimum management to maintain stability of site and sustained yield in beaver production, but requires systematic harvest to prevent over-populations and depletion of food supplies with accompanying abandonment and deterioration of dams. These sites provide the best available habitats for trout, water fowl, and aquatic animals.

2. Good - Valley grade: 7-12 percent; 0-12 for rhyolite; improves with decreasing grade. Valley width: Wider than width of channel, improves as width increases. Rock type: glacial till, schist, granite, and rhyolite, in that order. Management requirements: Intensive management is required to maintain stable populations in balance with food supply, so as to avoid abandonment followed by dam failures and resultant channel and valley erosion. Provides fair to good habitat for trout and aquatic game.

3. Questionable - Valley grade: 13-15 percent; 0-15 percent for shale. Valley width: Wider than width of channel, but usually narrow. Rock type: Glacial till, schist, granite, rhyolite, shale in that order. Management requirements: Constant trapping is required to keep populations low enough to avoid dam breakage and channel erosion. Comparatively few beaver are found on these sites and establishment of new colonies should be discouraged, especially on shale. May offer fair to good trout habitat, but generally poor for water fowl and aquatic fur bearers.

Topography

4. Unsuitable - Valley grade: Over 15 percent. Valley width: Seldom wider than channel. Rock type: Unsuitable regardless of rock type. Management

*The following material is taken in both direct quotation and paraphrase from The Beaver in Colorado. William H. Rutherford. Technical Publication No. 17. Colorado Game, Fish and Parks Department. 1964.

requirements: Beaver seldom occupy and never remain on Class 4 sites. Temporary residences should be removed wherever channel instability is evident, but can be ignored where stream beds contain large boulders, since environmental resistance will force their departure.

In using this classification system, valley grade should be considered first. Any valley that is no wider than the stream channel is unsuitable, regardless of grade or type of rock. Rock type is limiting only when it is rhyolite or shale. Stream sections in shale are always questionable regardless of grade.

Food Supply

In Colorado it was found that beaver colonies in lowland cottonwood types were more productive than those in highland aspen or willow types, probably as a result of opportunity to feed yearlong on green vegetation. In highland types, where beaver must gather and store food for winter periods, colonies in aspen types averaged five animals, while those in willow types averaged four animals in size.

Good highland beaver habitat will have willows in the bottoms and aspens on nearby adjacent slopes. Trees farther than 100 yards from bottoms are seldom utilized. Beaver will make limited use of alder, bog birch and other woody species including conifers, but use these species primarily for construction purposes rather than food. In addition to the staple food items, aspen and willow, beaver will feed on sedge, cattail roots, water lilies and other emergent aquatic vegetation. The loss of willows and aspen within 100 yards of bottoms, will result in abandonment of a beaver colony.

Economies

In addition to value of pelts (which sold for $6.75 each in 1963), beaver are chiefly valuable for the following reasons: (1) The aquatic habitat in beaver ponds attracts ducks and aquatic fur-bearers. In addition to natural and man-made lakes and ponds, the only other habitat where these species occur is that provided by beaver. (2) Beaver ponds are highly beneficial for trout at higher elevations. The warmer water and increased biological activity in these ponds favors this fish. The belief that beaver dams hinder movement of trout to suitable spawning areas has been disproven. (3) Beaver impoundments often serve as stream-flow maintenance dams. Often the only water found in some intermittent streams is that in the ponds and in sections of stream below ponds. (4) Beaver have a high esthetic value for recreationists.

Coordination

Heavy use by deer, elk, or livestock resulting in over-browsing, rubbing and trampling of aspen reproduction and willow stands, adversely affect the beaver food supply. Depletion of food supply can lead to abandonment of site by beaver.

Beaver on public lands may damage or jeopardize roads, trails, bridges, culverts, campgrounds, and meadows, by their impoundments, ditches, and tunnels. They may damage watersheds by depletion of willow and aspen. Once a colony site is abandoned, siltation of stream can result from dam washout and from subsequent channel and bank erosion particularly when Class 2 or 3 sites are involved.

Management

A correlation was found to exist between the number of beaver colonies and the number of winter food caches present. Counts of food caches should be made in late October to keep track of beaver population trends. Beaver carrying capacity in acres per colony of four or five animals may be determined for food type and quality as shown below:

	Stand Quality		
Food Type	Good*	Average**	Poor***
Aspen	4 acres	6 acres	8 acres
Willow	12 "	18 "	25 "

* Tall, closed stand, vigorous growth
** Medium height stand, some openings, good growth rate
*** Low, open stand; slow growth rate

The acres per colony figures shown above should be adjusted for deer and livestock use as follows:

L - Browsing only on borders of aspen or willow stands - 10 percent
M - Browsing noticeable throughout stands - 25 percent
H - Light hedging of aspen and willow reproduction, stands beginning to open - 50 percent
D - Severe hedging, stands dying - 75 to 100 percent

Transplanting

There is a school of thought that clings to the idea that any beaver is more valuable alive than dead. Often the contrary, in regard to surplus beaver, may be true. In many instances, the best policy in handling surplus or nuisance beaver is that of steel-trapping and pelting. It is not the intention to condemn transplanting to suitable unoccupied sites. However, too much transplanting has been done merely to get rid of surplus animals. They have been placed in unsuitable sites or introduced to sites where populations are already present. In the first instance, they will move elsewhere and may continue to be troublesome. In the second place they may be pushed out by the residents or may be allowed to stay and add to competition for existing food. Where purposeful transplanting is in order, beaver should be taken from sites similar to that where it is planned to introduce them. Beaver accustomed to aspen diet will not immediately accept a diet of willow; river beaver will not readily adapt to small streams. Finally, transplants should be made of mated pairs of adult beaver for best success.

***

Chronologic History of Beaver in the
San Bernardino National Forest

Year	Location	No. of Beavers Male : Female	Remarks
1945	Tahquitz Valley	2 : 3	Released
	Banning Creek	2 : 3	Released
1946	Willow Creek (Arrowhead)	2 : 2	Released
	Santa Ana River (Big Meadow)	2 : 2	Released
1947	Grass Valley Creek	2 : 2	Released
	Cienega Redondo	3 : 3	Released
	Holcomb Creek	1 : 2	Released
	Coxey Creek	1 :	Released
	Arrastre Creek	2 : 3	Released
1948	Santa Ana River (Big Meadow)	2 : 2	Released
	Cienega Seca Creek	2 : 2	Released
1949	Willow Creek (San Jacinto)	3 : 2	Released
	Strawberry Creek (San Jacinto)	3 : 4	Released
	W. Fork Mojave River (Cedar Springs)	? : ?	Released
	Lytle Creek	? : ?	Released
1952	Wellman Ranch (San Jacinto)	2 : 3	Released
1954	Wellman Ranch (San Jacinto)	2 : 3	Gone
1957	Santa Ana River		
	Prison Flats	3 colonies	Sustaining
	Heart Bar	4 colonies	Sustaining
	Seven Oaks	1 colony	Sustaining
1961	Santa Ana River		28 dams silted-in; 17 active dams

(Bear Valley Mutual Water Company, California Department of Fish and Game and the Forest Service drew up a cooperative agreement to maintain beaver activity to only 8 dams in the Santa Ana River Watershed). The results of these surveys follow.

1962	Santa Ana River		
	Heart Bar	1 colony	7 dams
	Flats	1 colony	3 dams
	Convict Flats	1 colony	4 dams
	Converse		1 dam
	Slide Lake	1 colony	2 dams
1963	Santa Ana River		
	Heart Bar	1 colony	4 dams
	Camp Osceola	1 colony	2 dams
	Camp River Glen	2 colonies	4 dams
1964	Santa Ana River		
	Camp Osceola	1 colony	5 dams
	Convict Flat	1 colony	5 dams
	Slide Lake	1 colony	6 dams

Year	Location	No. of Beavers Male : Female	Remarks
1965	Santa Ana River		
	Camp Osceola	1 colony	4 dams
	Convict Flat	1 colony	6 dams
	Slide Lake	1 colony	1 dam
	(In compliance with the Cooperative Agreement of 1961 the California Department of Fish and Game removed 3 beaver from Slide Lake and 6 beaver from Camp Osceola and Convict Flat)		
1966	Santa Ana River		
	Camp Osceola	1 colony	3 dams
	Convict Flat	1 colony	Activity
	Slide Lake	1 colony	Activity
1967	Santa Ana River		
	Camp Osceola	1 colony	2 dams
	Convict Flat		No activity
	Slide Lake		No activity
	Banning Creek		No activity
	Cienega Seca Creek		No activity
	Holcomb Creek, Upper	6 colonies	Area occupied since beaver were released
	Holcomb Creek, Lower	2 colonies	8 dams
	Coxey Creek		No activity Last activity in 1965.
	Coxey Pond		No activity Last activity in 1965
	Arrastre Creek		Last activity in 1963.
	Deep Creek		
	Arrowbear Lake	1 colony	Beaver have become a problem.
	Fisherman's Camp		Last activity in 1965.
	Holcomb Junction		Last activity in 1965.
	Devils Hole	2 colonies	5 dams
	Warm Springs	1 colony	4 dams
	Flume	1 colony	4 dams
	Cienega Redondo	1 Beaver	Later was removed.
	Lake Arrowhead		
	South shore	1 colony	Tree cutting and wharf damage.
	East shore	1 colony	Tree cutting and wharf damage.
	West Fork Mojave River	1 colony	Activity
	Willow Creek (Arrowhead)	1 colony	4 dams
	Grass Valley Creek		No activity
	Tahquitz Creek		No activity
	Willow Creek (San Jacinto)		No activity
	Lytle Creek		No activity

WILDLIFE PLAN FOR FURBEARERS AND RELATED SPECIES

INTRODUCTION

The early history of California was influenced more than is generally realized by the fur trade and organized efforts to capture furbearing mammals (Grinnel, Dixon and Linsdale, 1937). Trading in furs was well established before 1785. In fact, in that year the Spanish authorities issued the first regulations governing the take of a furbearing animal which applied to the take of sea otters. In early years the sea otter, fur seal, and beaver were the main species sought. The first overland expeditions to California, that of Jedediah Smith and others, arrived in California in 1826, their main purpose was beaver trapping. Sutter, whose headquarters later came to be known as Sacramento, trapped furs as a considerable part of his business activities.

Commercial fur trapping exists as an economic pursuit to the present day, although it is a minor activity. Except for a few species, furbearing mammals are still common within the State. Economic conditions rather than the supply of animals have generally been the greatest influence on the commercial trapping efforts in recent years.

At the present time the protective list includes the wolverine, pine marten, fisher, kitfox, and river otter. It may become necessary to add such species as red fox and badger to the protected list, in certain areas of the State, in order to preserve at least representative populations. The sea otter is totally protected, and is considered under the marine mammal section of the marine resources plans.

Among the furbearers are species of very restricted range and those that are as wide ranging as any form of wildlife we have. They can be grouped into three general types: water-associated species, mountain or wild land species, and wide ranging species.

Water-associated species include beaver, muskrat, river otter and mink. The recently introduced nutria falls in this category. These species all require wetlands of some kind, rivers, sloughs, marsh, lakes, etc., and are found nowhere except in aquatic situations.

Mountain or wild land species include: wolverine, ermine, marten, fisher, ring-tailed cat, red fox, mountain lion, bobcat and possibly badger and kitfox. The latter two species will tolerate some human activity but generally decrease markedly as human activities invade their domain. Of these species the wolverine is extremely rare; the fisher, red fox, and kitfox are rare.

Among the very wide ranging species we have the striped and spotted skunks, long-tailed weasel, gray fox, coyote, opossum, raccoon and housecat. In this group the raccoon favors the vicinity of water but ranges widely in smaller numbers. All of these are quite tolerant of human activities.

For most of the furbearer species adequate stocks will be available to 1980 to satisfy commercial trapping, sporting and aesthetic uses. Commercial trappers numbered 616 in 1963. Estimated use by 1980 will be 400 to 600. Of the current species now being utilized, a few will require careful management to maintain stocks; namely, mink, badger, beaver, red fox and mountain lion. Pine marten, river otter, wolverine, fisher, and kitfox are now totally protected.

THE PLAN

PROBLEMS RELATED TO MAINTENANCE OF THE RESOURCE

Preserving the Habitat

Furbearers have suffered like other forms of wildlife from a shrinkage of suitable habitat. This situation has been most critical in agricultural areas. This group of animals generally requires rather heavy cover. The rapid disappearance of riparian habitat along valley streams affects furbearers adversely. Also, clean farming practices take their toll. The over-all shrinkage of wetland acreage is another factor.

Removal of cover exposes the animals, which they will not tolerate, and reduces prey species that likewise require dense cover. Tree hole denning species such as the raccoon and ring-tailed cat are virtually eliminated when large, mature trees are cut down along rivers and as pockets of natural vegetation are removed to provide more farm land.

The species that have been most adversely affected by farming practices are the San Joaquin kitfox and the badger. The kitfox has been reduced to near extinction along the entire west side of the valley where it was formerly common. Its ancestral range has been developed into farm land. A related variety, the desert kitfox, is in somewhat better shape. Badgers, now are confined almost exclusively to wild lands, having virtually disappeared from farming areas.

Pockets of wild land habitat within areas of high human activity must be preserved if we are to maintain usable populations of the more common furbearers for sporting, aesthetic, commercial and educational purposes in settled areas.

Generally, wild land habitat with the exception of the aforementioned situation is not in critical condition from the standpoint of maintaining furbearers.

Program for Preserving Habitat. Furbearers generally require heavy cover for concealment. However, there are no problems concerned with preservation of habitat that do not equally apply to other forms of wildlife. In other words, good quail, rabbit or pheasant habitat is also good furbearer habitat.

The most acute problems are associated with areas of heavy human settlement. If we are to have repre-

sentative furbearer populations in the Great Valley, we must preserve riparian vegetation along streams and retain pockets of wild land in farming areas. See major problem plan for riparian habitat.

Problems Related to Pest Control

The amount of vertebrate pest control for rodents on range and crop lands has averaged about 7 million acres treated within recent years. The target animals on about 6 million acres were ground squirrels. About a million acres were treated for control of gophers, jackrabbits, meadow mice and kangaroo rats. Poison baits used were over half 1080 with lesser amounts of strychnine and zinc phosphide.

Vertebrate pest control is a management tool in protecting forest plantings. As the value of forest products increases, we can expect an increase in this activity.

Local control of rodent reservoirs of disease as a public health practice is mainly confined to urban and heavily used resort areas.

The effects of these programs on populations of furbearers is little understood at the present time. Effects can be direct as in poisoning from furbearers eating poisoned rodents or indirect from the decrease of food supplies or prey species.

As far as we know in recent years in California, losses of furbearers have been light following squirrel poisoning programs. In the first years of 1080 use coyotes were reported drastically reduced in Monterey and San Benito counties.

The use of 1080 poisoning stations for coyote control in the Canadian life zone has been stopped because of hazards to marten, fisher and wolverine. Howevet, this whole field of activity is in need of more precise evaluation.

Program Related to Pest Control. Control of rodents to protect crops, forests and the public health are recognized as legitimate and necessary activities. These are functions of the State Department of Agriculture, the counties, U. S. Fish and Wildlife Service, and private enterprise.

The Department will maintain a continuing program of liaison with all agencies, public and private, involved in pest control activities in order to:

(a) Evaluate effects on wildlife of established and new techniques of pest control.

(b) Insist on the use of techniques having the least effect on nontarget wildlife.

(c) Insist that pest control programs be operated on basis of need rather than general programs of prevention before the need arises.

(d) Insist that extreme caution and care in the placement of poison impregnated baits be exercised in order to reduce hazard to nontarget wildlife.

(e) Insure that wildlife values are taken into account in pest control programs.

(f) Encourage pest control agencies to participate in research activities related to minimizing the deleterious effect of pest control programs. Support research in pest control methods by furnishing observers and wildlife information.

Stocking and Transplanting—Introductions

Stocking and transplanting as a means of extending range and bolstering depleted populations has its application to management of furbearers. A rather extensive program to increase the beaver resource has been carried on in California. The first attempt at stocking beaver was accomplished in Plumas County by the U. S. Forest Service in 1923. The program reached its peak in years from 1945–55 when the Department of Fish and Game live-trapped and stocked 3,000 beaver and moved them into virtually every suitable area in California. This program was very successful in establishing the species throughout the State. In the period 1955 to the present, efforts were continued mainly to remove nuisance beaver or to bolster depleted populations.

The program proved the feasibility of stocking as a management tool for beaver. Undoubtedly, other species of furbearers would lend themselves to such management if the need should arise. Pine marten and fisher are possible species for such a program.

Some words of caution are in order regarding stocking and transplanting. Our experience with beaver has indicated that considerable problems can arise through ill-advised stocking programs. With beavers, depredation problems have been created and actual destruction of scenic riparian habitat situations has occurred. Careful pre-stocking appraisal of the stocking area should be made before any program is carried out.

From the scientific and aesthetic point of view any stocking program should avoid mixing of natural racial stocks in order to preserve the natural situation to the extent possible.

Two exotic species have become well established in California. The opossum was introduced by private individuals as early as 1900. It is now widespread and common in the Great Valley and along the coast south to southern California. It is, no doubt, still extending its range in the State.

The other introduction is the housecat which has now become a common free-ranging animal, especially near urban areas and farming communities. There is evidence that populations of this animal of 50 per square mile occur in favorable habitat. The deplorable habit of people dumping unwanted cats in the country has widely dispersed the species.

Another exotic, the nutria, has established itself in limited areas having been reported locally along the

San Joaquin River and at Dominguez Channel in the Los Angeles area. Such establishments are the result of escapees from fur farms. Efforts are being made to eliminate such wild populations as a spread of these animals would be a threat to agricultural interests.

A few native species have been dispersed more widely than their original range. The Department's beaver transplanting program is an example. The muskrat originally present in the Great Basin and Colorado River area, now is common virtually throughout the State in suitable wetland habitat.

The introduction of furbearers into any new area should be approached with extreme caution. Several species are now excluded from the State because of their predatory nature and their possible adverse effect on native wildlife. Examples of these are the mongoose and ferret. Of the already introduced species, the opossum and the housecat, it would be safe to say that any real benefits from these are doubtful when weighed against adverse effects on native wildlife.

The spread of the beaver and muskrat has been a mixed blessing. We have a harvestable fur resource of some value, but we also have an agricultural problem from the presence of these animals.

There is a possibility that transplanting some of the rarer furbearers could be considered. Range extension of the pine marten, fisher and possibly the river otter may be desirable.

Program for Stocking, Transplanting and Introductions. The laws governing the importation of animals are designed to protect the State from accidental or intentional introduction of animals which may cause problems to agriculture, public health, or may displace native wildlife species.

Fur farming and private animal collections must be closely regulated to insure that facilities are adequate to prevent escape to the wild. The recent introduction of nutria into California resulted from escapes from fur farmers. This animal is a threat to irrigation systems because of their burrowing activities.

Virtually all suitable beaver sites were stocked during an active Department program of the early 1950's. Some lessons were learned from this program in that depredation problems can develop both on farm water systems and actual destruction of scenic meadow lands. Future beaver transplants will no doubt be quite limited and made only after careful consideration of the economic and ecological consequences have been thoroughly evaluated.

For the future, a small program of trapping and transplanting fisher, pine marten and river otter can be undertaken. There is, no doubt, some suitable habitat not now occupied.

PROBLEMS RELATED TO USE OF THE RESOURCE

Commercial Trapping

Section 4000 of the Fish and Game Code lists furbearing mammals as pine marten, fisher, wolverine, mink, river otter, gray fox, cross fox, silver fox, red fox, kitfox, racoon, beaver, badger, ring-tailed cat and muskrat. Except for protected species these animals may be taken between November 16 and the day before the last day of February. This listing is somewhat confusing as coyote, bobcat and some others also have fur of commercial value and of a value on the present market higher than some listed species.

Generally, present laws are adequate to prevent overuse from fur trapping. Further, the economics of fur trapping tends to impose a limitation on the take of animals. As the supply drops it is no longer a paying proposition, even for such high-priced animals as mink.

A few of the more vulnerable species such as river otter, marten and fisher are presently protected. Otter and marten could possibly be reopened to trapping at some future date if supplies warrant it. In any event, these species will require careful management to maintain stocks.

Program for Commercial Trapping. The present licensing system combined with a mandatory reporting procedure has been of value in providing the Department with statistical data on the fur take. This practice should be continued.

For the present, wolverine, fisher, pine marten, river otter, and kitfox are protected mammals. For the time being, all of these should remain so. Pine marten and river otter, if populations build up, could be reopened to commercial trapping on a limited and carefully managed basis. Wolverine and fisher should probably be protected permanently.

The Sierra red fox should be added to the protected list. It is a boreal species in California confined to wild areas from Mt. Shasta south to the southern Sierra. It is quite rare in California and in too few numbers to be a valuable fur resource or cause depredation problems.

The small red fox population in the Sacramento Valley, known to exist for 60 years, probably originated from escapees from fox farms or as an introduction by private citizens and as such warrants less concern than the Sierra population.

The kitfox should continue to receive protection as the fur is of no value and it is a generally inoffensive and interesting animal. It is further in danger of being extirpated from much of its former range.

Sporting Use of Furbearers

The pursuit of furbearers for sport will continue to grow. Included are hound trailing for mountain lion and racoon, predator calling and so-called varmint shooting. The main increase is expected in predator

calling and varmint shooting. All of these activities are excellent outdoor recreational pursuits.

Sporting use of furbearing mammals is receiving wide publicity as a recreational pursuit. In fact, we agree with the Leopold Report on Predator and Rodent Control in the United States (1964) that sport hunting for carnivores on a sustained yield basis is a highly desirable form of resource use. Certainly this activity could provide many more man days of outdoor recreation as the potential is there.

Program for Sporting Use of Furbearers. It is conceivable that as these activities grow it will be necessary to regulate the take to preserve some species. In 1965 the kitfox was placed in the protected category. The following action should be taken:

(a) Establish a sporting season on furbearers to run from about June 1 through to February 28, the close of the regular trapping season. This would allow a period of closure during the time the young are being brought off.

(b) Allow sport hunting only during regular hunting hours, one-half hour before sunrise to one-half hour after sunset. Exception can be made to allow racoon hunting at night.

(c) Require a hunting license for sport take of all species.

(d) Establish a tag system for taking mountain lions and designate them as a game animal as in the case with bears. This is an important species to maintain as a part of the native fauna of the State. This would give the Department a record of the take from which to evaluate trends in kill which reflect populations.

Aesthetic and Educational Use of the Fur Resource

Furbearers have always caught the public fancy. Their depredating habits have caused controversy; their furs are beautiful; mountain lions have produced awe, and beaver dams have produced wonder to list a few of the reasons.

Except for fleeting glimpses, most human contact from an aesthetic point of view is with voices, signs or works of these animals. Perhaps their secretive ways have an appeal, and an actual sighting of one of these animals is usually an event that firmly imprints on the mind of even those individuals that have a passing interest in animals.

Although observation of furbearers in a zoo is a poor substitute for observing the animal in a natural setting, zoo touring is still one of the most popular public pastimes. This is certainly a legitimate form of use of furbearers. Fortunately, these animals lend themselves to artificial confinement and do well under proper conditions.

As a rule, city and county zoological collections are well cared for. However, a number of private collections exist in the form of roadside zoos. Conditions of confinement often leave much to be desired. Complaints are often directed to the Department of Fish and Game but it is difficult to obtain an improvement as there is no legal control over the environment maintained in private zoos.

Collecting of furbearers for educational, propagation and exhibition purposes is recognized as a legitimate use.

Program for Aesthetic and Educational Use of Furbearers. The requirement to obtain a collector's permit should be retained, with collecting permits issued subject to conditions which allow for the maintenance of natural stocks.

The State should have control of private zoos. Revocable permits establishing operational standards should be issued by the Fish and Game Commission. Periodic inspections would be made by the Department.

The present program of supplying schools with educational materials related to furbearers should be continued.

PROBLEMS CAUSED BY THE RESOURCE

Depredation

Furbearers, except for the rodent species, are carnivorous animals. They, therefore, require prey which involve on occasion game species and the farmers' livestock. As a result, there is probably as much controversy on the whole subject of predatory animal control as any phase of wildlife management.

The earliest wildlife management activities included predatory animal control based on the premise that this was an effective method of increasing the numbers of game species. Although many investigations throughout the United States have discounted predator control as a generally effective tool of game management, the public has yet to entirely accept these findings. There is still considerable demand voiced for increased predator control.

Depredation on livestock by furbearers is a continuing problem. Problems have been commonly reported on sheep ranges where the coyote is most often implicated. The Fish and Wildlife Service reports a loss of 4,257 sheep from coyotes for fiscal year 1963–64. This figure is a compilation of rancher reports. The natural tendency is to report on dead sheep that show signs of coyote feeding as actual coyote kills. This may or may not be an accurate appraisal of the situation. Bobcats also have been implicated as sheep depredators but to a much lesser degree than coyotes.

Poultry are often taken by predators. Here, a number of species of furbearers are implicated.

It is accepted that a certain amount of predator control to prevent livestock losses will have to be carried out. Usually, the situation is a local problem and can be taken care of by removal of a few nuisance animals which have acquired the depredation habit.

Program for Depredation Control. The Department recognizes that depredation control is needed to protect agricultural enterprises. Some principles should be adhered to as follows:

(a) Depredation control should continue to be a function of the Fish and Wildlife Service, State and county agricultural departments and the private sector.

(b) Depredation control must be limited strictly to areas of need. General depredation control over wide general areas should not be practiced as it results in a waste of public moneys and depletion of the fur resource.

(c) Channelize animal control efforts towards use by commercial trapping and by sport take to the maximum extent possible.

(d) General predator control as a tool of game management will not be practiced. Department efforts in predatory animal control should be strictly limited to intensively managed game areas such as waterfowl management lands to protect nesting birds. This program can be handled by installation personnel.

(e) In any depredation or predator control program the object must be control to tolerable limits and not extermination of the target animals.

(f) The bounty system for taking depredators is not recommended. All studies on bounty systems have recommended discontinuance.

In the case of depredating animals, Department personnel are not authorized to kill the offending animals; this function is carried on by the landowner or such governmental agencies as the State Agriculture Department and the U. S. Fish and Wildilife Service. This procedure should be continued. In the case of beaver, Department personnel may live trap the offending animals and transplant if suitable areas can be found. The Department's role will be to furnish advice and technical assistance to the control agencies.

Reservoir of Disease

As a reservoir of disease there is only one major disease entity involved with furbearing animals, rabies. The Department of Public Health reported 306 cases of rabies in various animals in 1963. Furbearers were involved as follows: skunks 145, foxes 5, bobcat 4, and coyote 1. There were 53 cases in bats and the remainder occurred in various domestic animals.

Control of rabies is carried out in two ways: by vaccination of domestic animals and by controlling wild animal numbers in local rabies areas when the disease is detected.

Program for Disease Control. Rabies control work is largely done with local county control personnel with technical and supervisory assistance by the predatory animal control program of the State Department of Agriculture and the U. S. Fish and Wildlife Service.

Department liaison with agencies involved with rabies eradication programs is needed to evaluate situations to insure only needed activities are performed.

IMPLEMENTATION

Before an active program for the conservation of our fur resources can be put into effect, a great deal of information on the animals needs to be acquired.

The most critical needs are in two fields of investigation. The first is related to general information on the status and trends of our furbearer populations. The second is related to critical evaluations of pest control programs.

California studies on furbearers have been rather limited. A major study on the status of beavers was completed in 1943 and a general survey of fur resources was reported in 1945. Food habits studies on the coyote were completed in 1953, the same year a minor report was written on bobcat food habits. About this time a food habits study on feral housecats was made. Actually, our most recent intensive survey work on furbearers is now 20 years old.

These investigations produced results which led to the beaver transplanting program, restrictive legislation protecting fisher, marten and river otter and to a more realistic attitude towards predator control.

At the present time the Department is working with the pest control agencies in evaluation of these programs as they relate to nontarget wildlife. However, the program is minimal due to limitations of manpower and funds. There is a need for more active participation of the pest control agencies themselves in research along this line to supplement Department efforts.

The research activities of the educational institutions could be directed towards solving problems related to conservation of furbearers. What is lacking is a more active program of contacting these institutions pointing up needs and problem areas.

There is a great need for public understanding of the role of furbearers in the natural environment. Until such is achieved we will continue to have poorly managed predator and pest control programs and will continue to have demands to institute predator control as a game management tool.

The public must be alerted to the value of furbearers as a part of the natural environment through Departmental informational media and by soliciting the aid of the school systems and private organizations.

Department in-service training programs must include material on general furbearer information plus methods of educating the general public on the importance of this wildlife resource.

FOREST SERVICE SAN FRANCISCO 11, CALIFORNIA

TO : FOREST OFFICERS DATE: July 10, 1951

FROM : ASSISTANT REGIONAL FORESTER

SUBJECT: W-MANAGEMENT-Beaver

The beaver transplanting program of the Forest Service and State Division of Fish and Game has been more than successful in some areas. Several problems have developed:

1) The establishment of beaver (in Southern California particularly) in sections of streams where the potential flood damage is greater than if their dams were not present. In some places beaver dams would result in flood waters creating new channels or widening of existing ones.

2) The establishment of the animals in regions with a sparse stand of aspen resulting in over use or elimination of all trees near the water course - often the bulk of the stand where aspen is not abundant.

Forest officers should be alert to such conditions and recommend to local game managers the harvesting or transplanting of excess animals. The former is generally desirable since a nucleus exists in most drainages which should result in their full stocking soon.

/s/ F. P. Cronemiller

Excerpt from Bear Valley Mutual Water Company and United States Forest Service Agreement executed on June 12, 1961 by the United States Forest Service, Bear Valley Mutual Water Company, North Fork Water Company, and Lugonia Water Company.

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Seventh: The Forest Service will issue to Bear Valley a use permit for the maximum period allowed under its regulations and policies, and where its regulations and policies permit, at no cost, for the "spreading and recovery operations" mentioned above. Such permit shall also provide for the removal from the river of such obstructions, whether natural or artificial (other than those which are necessary parts of water diversions by or under the authority of the Forest Service, and except not more than eight beaver dams which shall have been agreed upon between Bear Valley and the Department of Fish and Game of the State of California), as tend to dam up, hold back or decrease the flow of water in the stream system during the irrigation season, and can in the public interest be removed. The Forest Service agrees not to construct additional artificial structures which will obstruct the flow of water in the stream system, without the prior consent of the companies.

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Beaver too eager on Santa Ana river .... nine removed

mal of a 22-lot subdivision proposed on the same property in August 1963 because of the "obvious flood hazard."

That tract, submitted by the American Land and Cattle Corportation of Garden Grove, was identical to a subdivision which gained Planning Commission approval in Sept. 1960, but was never constructed.

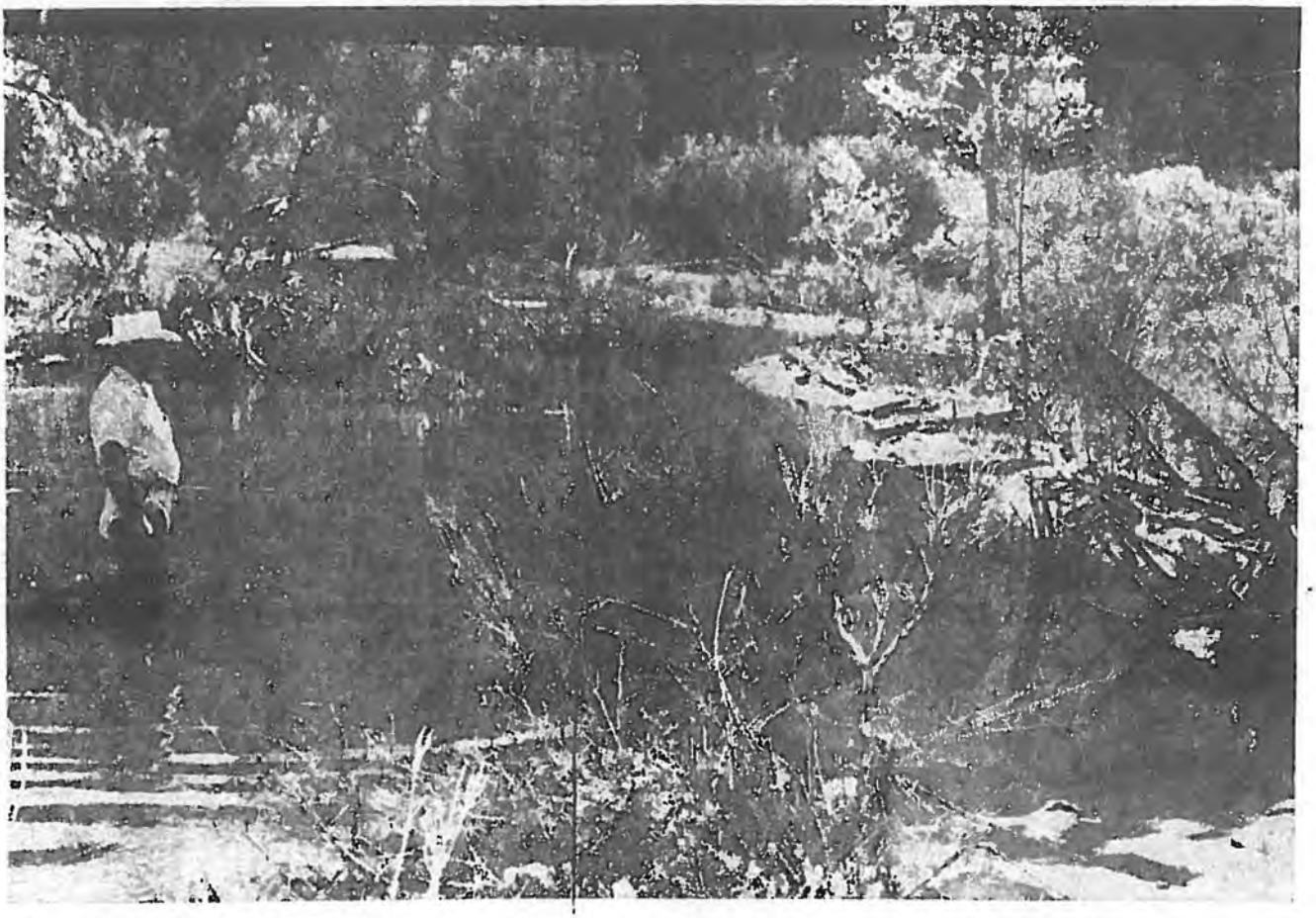
In 1963, however, the Planning Commission tabled action on the proposed subdivision until the developers provided an acceptable flood control plan.

Zeiner's application for a conditional use permit to establish a mobile home park "annex" on the property has rekindled the mobile home issue in Redlands. It has prompted the City Council to consider re-enacting a mobile home park ordinance, repealed in 1960.

In the absence of an ordinance, the project is being considered under specific ground rules fixed by the Council in August. Property development standards contained in a mobile home study ordinance have been appied to Zeiner's project.

BEAVER, BUT NOT EAGER — One of nine beaver trapped last week in the mountains east of Redlands was not at all eager to get its picture taken. The local beaver were live-trapped by the state Department of Fish and Game along the Santa Ana River drainage.

SETTING THE TRAP — Department of Fish and Game Trappers Bill Pollard and Bill Asserson select a well-traveled beaver run behind a small dam to set their large beaver trap. A T-shaped prong in center of heavy wire trap is so sensitive it can be triggered by a fish or a small frog. This is a live trap and the animal is not injured. Six of the nine beaver were captured in this area. Traps are checked each morning.



DAM BLOCKS THE SANTA ANA — The largest beaver pond on the Santa Ana is this one located adjacent to the river road between Seven Oaks and South Fork. Water companies complain that such dams result in loss of irrigation water in the valley. Bill Pollard, trapper for the Department of Fish and Game, examines the winding beaver-built dike at right. A network of six dams has been constructed here.

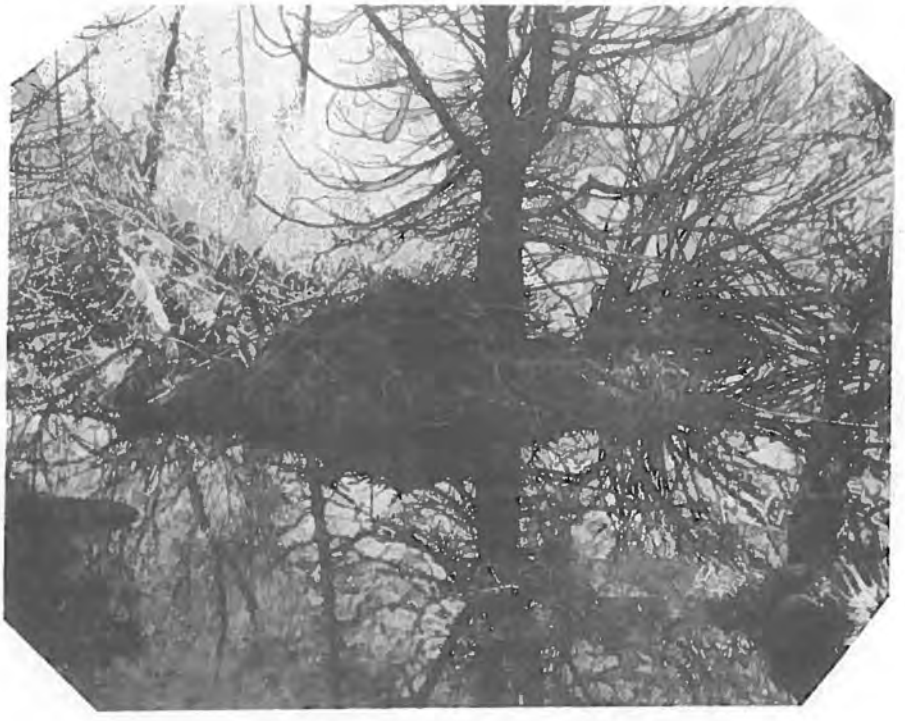
SLIDE LAKE LANDMARK — Hikers and fishermen who have camped at Slide Lake on Bear Creek in the mouth of the Santa Ana River drainage are familiar with this huge Beaver hut. The six-foot high pile of logs and mud is a classic example of how beaver construct their homes. Entrances are under water. Barry Humbert, U.S. Forest Service fire prevention technician, inspects stick used to build the hut.

Redlands Daily Facts, September, 1965

Beaver Pond (1966) silted to top of Dam after Fall rains of 1967, Cp Osceola.

Dam of above Pond

Santa Ana River



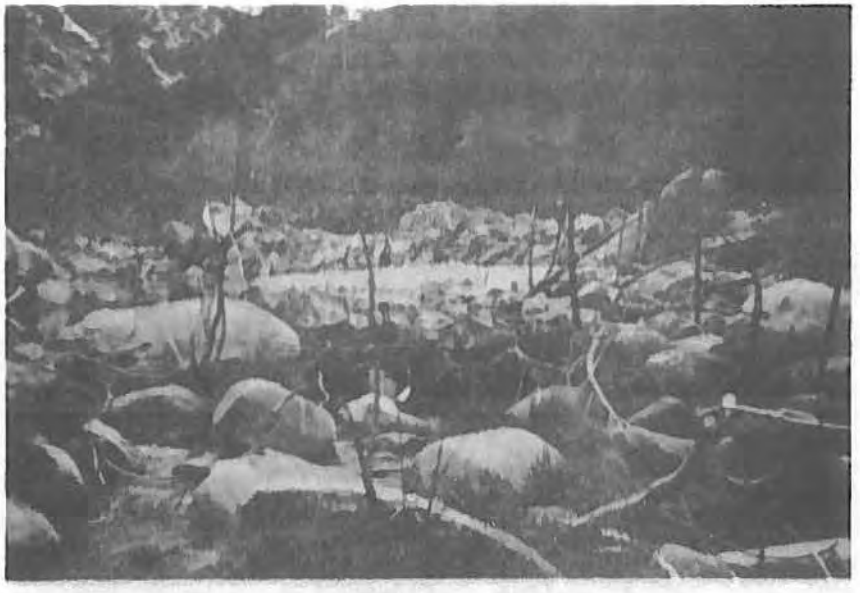
Beaver Hut

Beaver Activity on Sycamore

Deep Creek

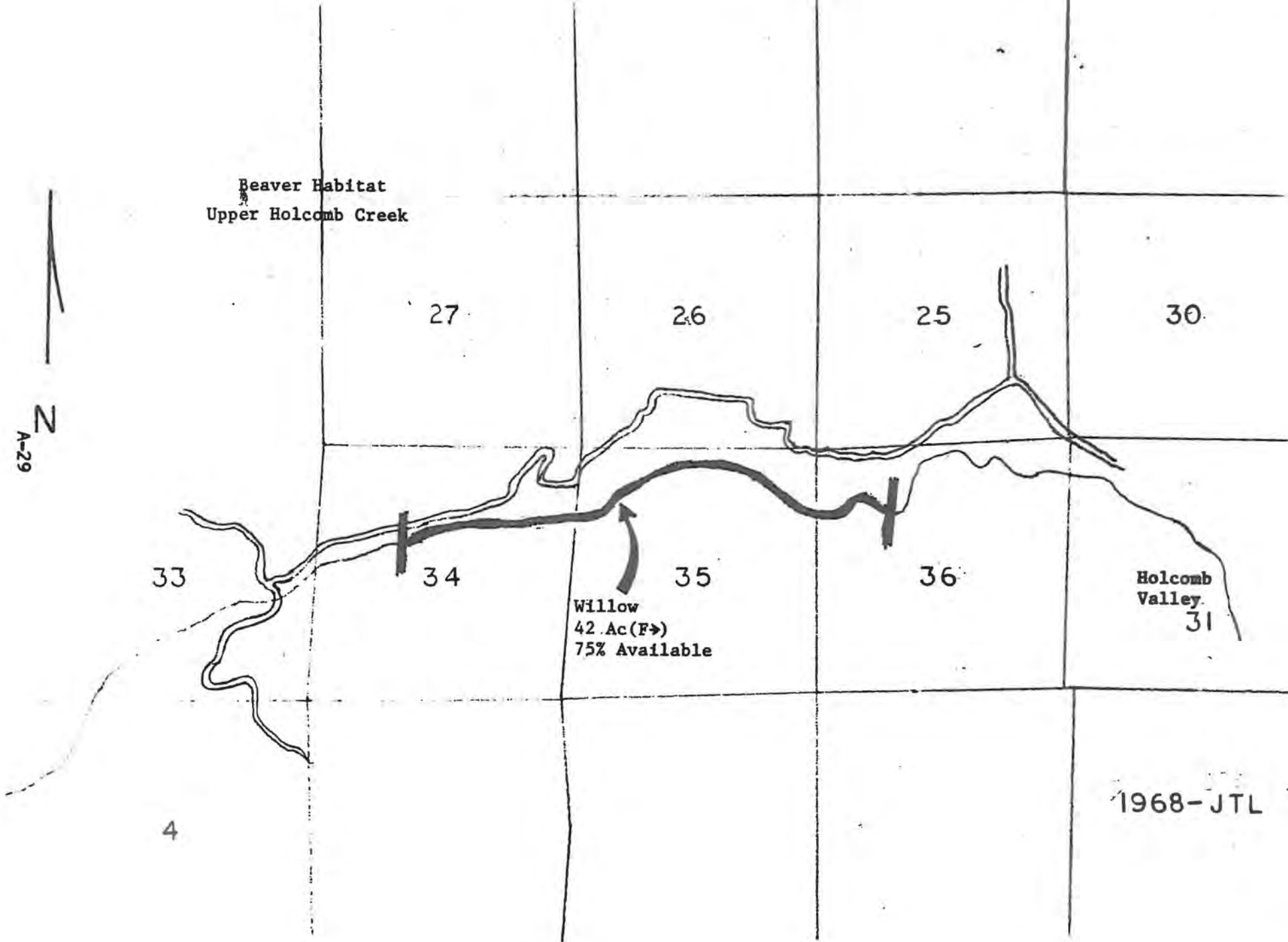
Typical Dam

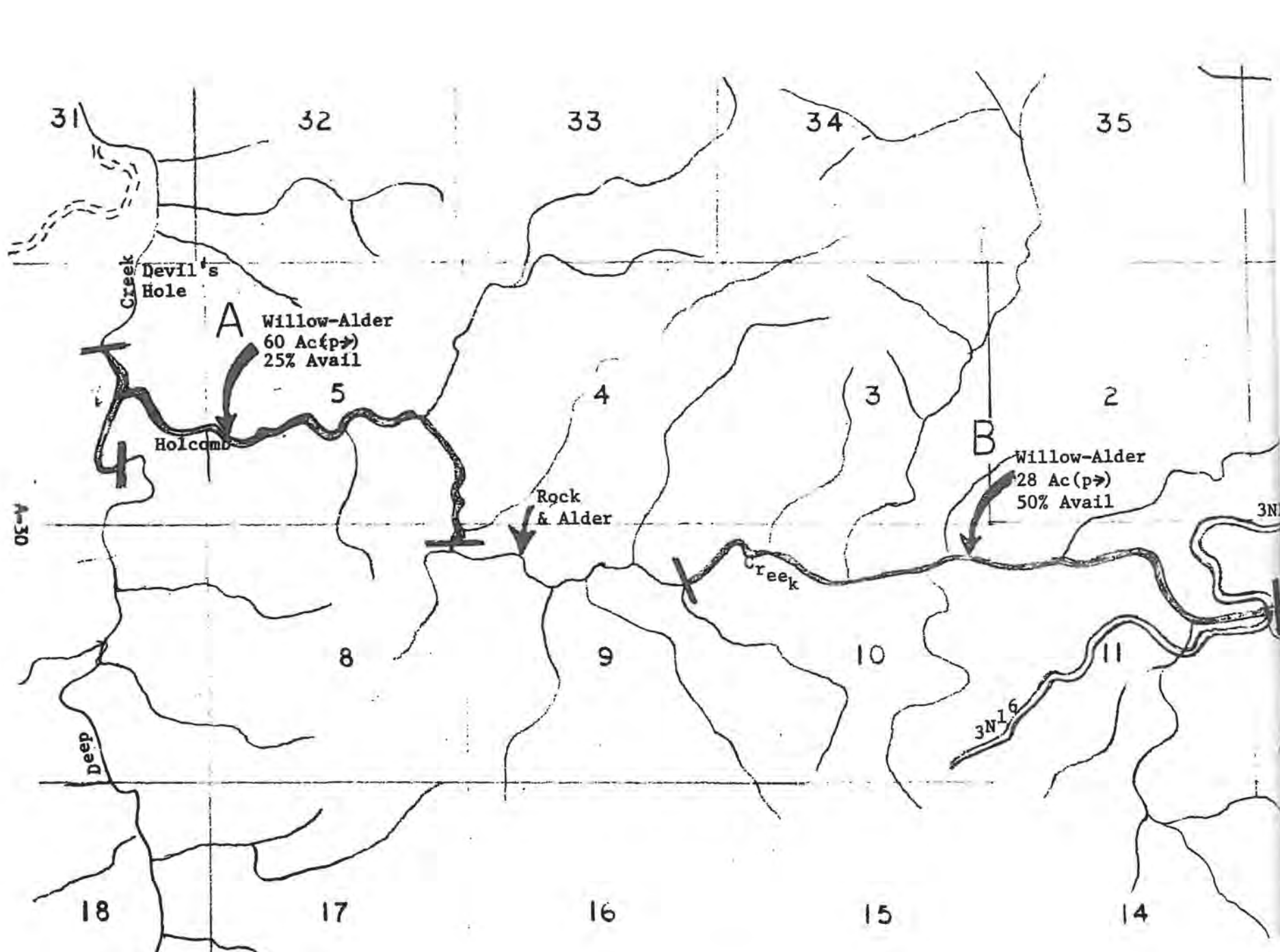
Pond behind Dam

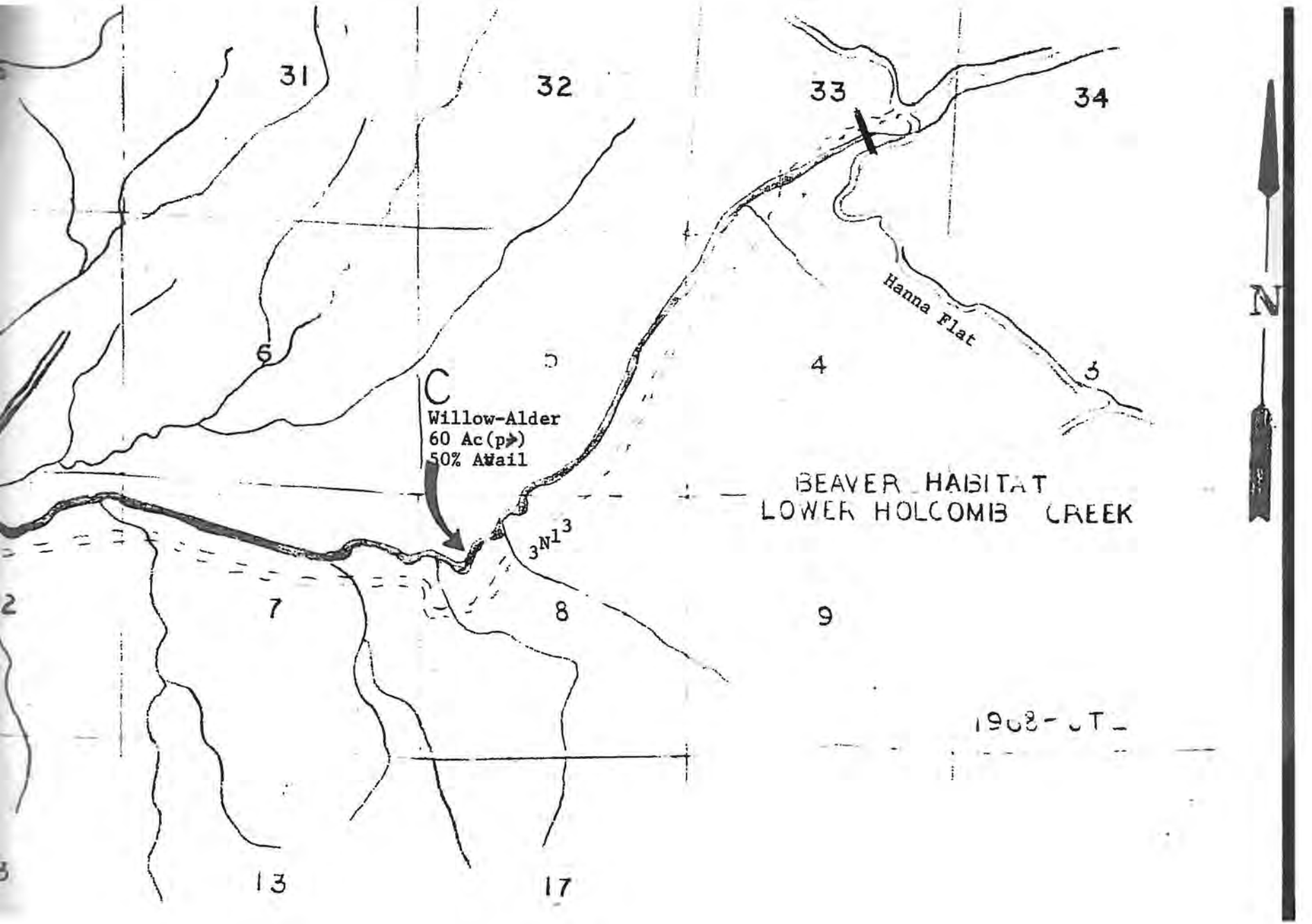


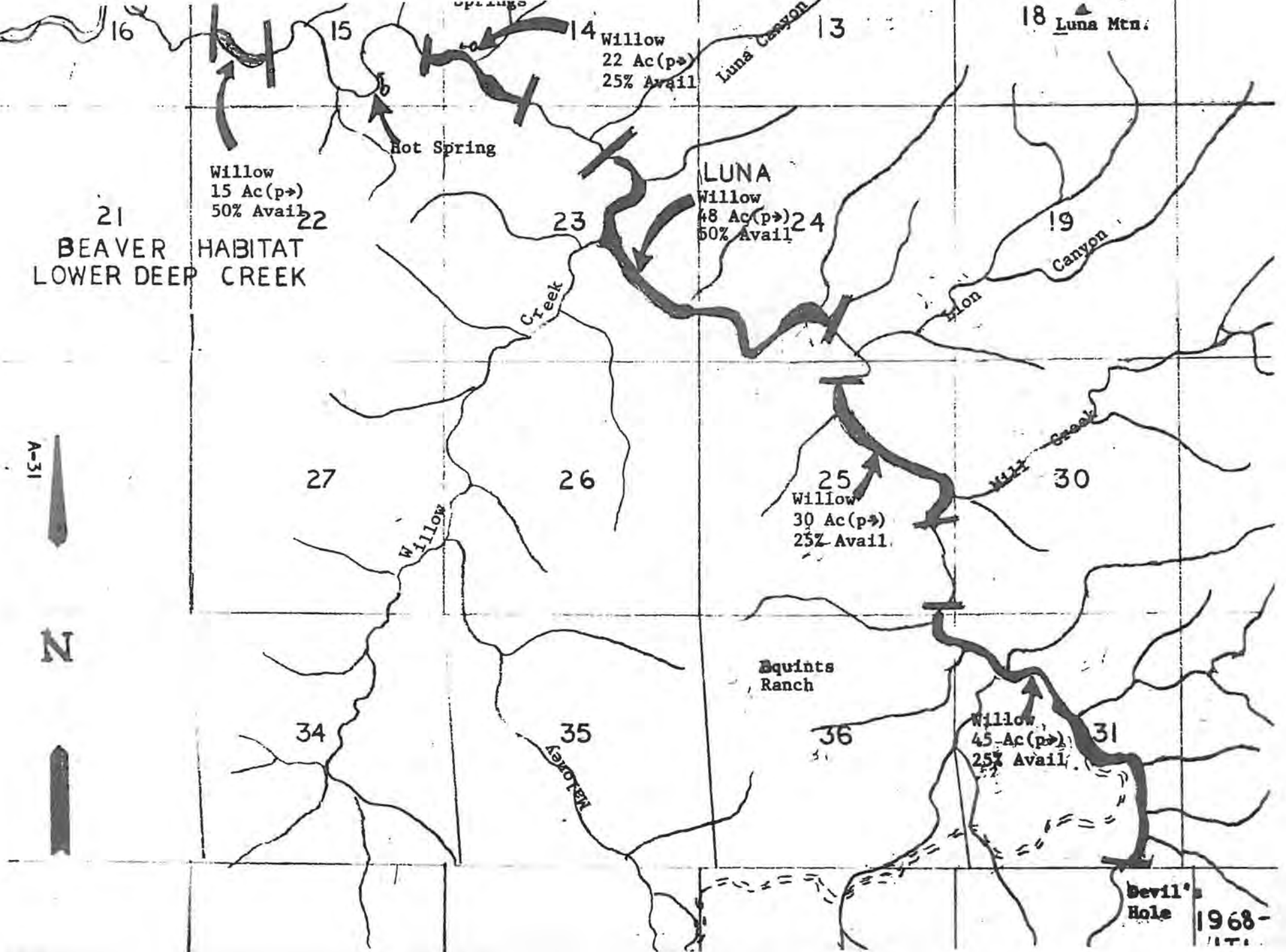
Larger Beaver Dam

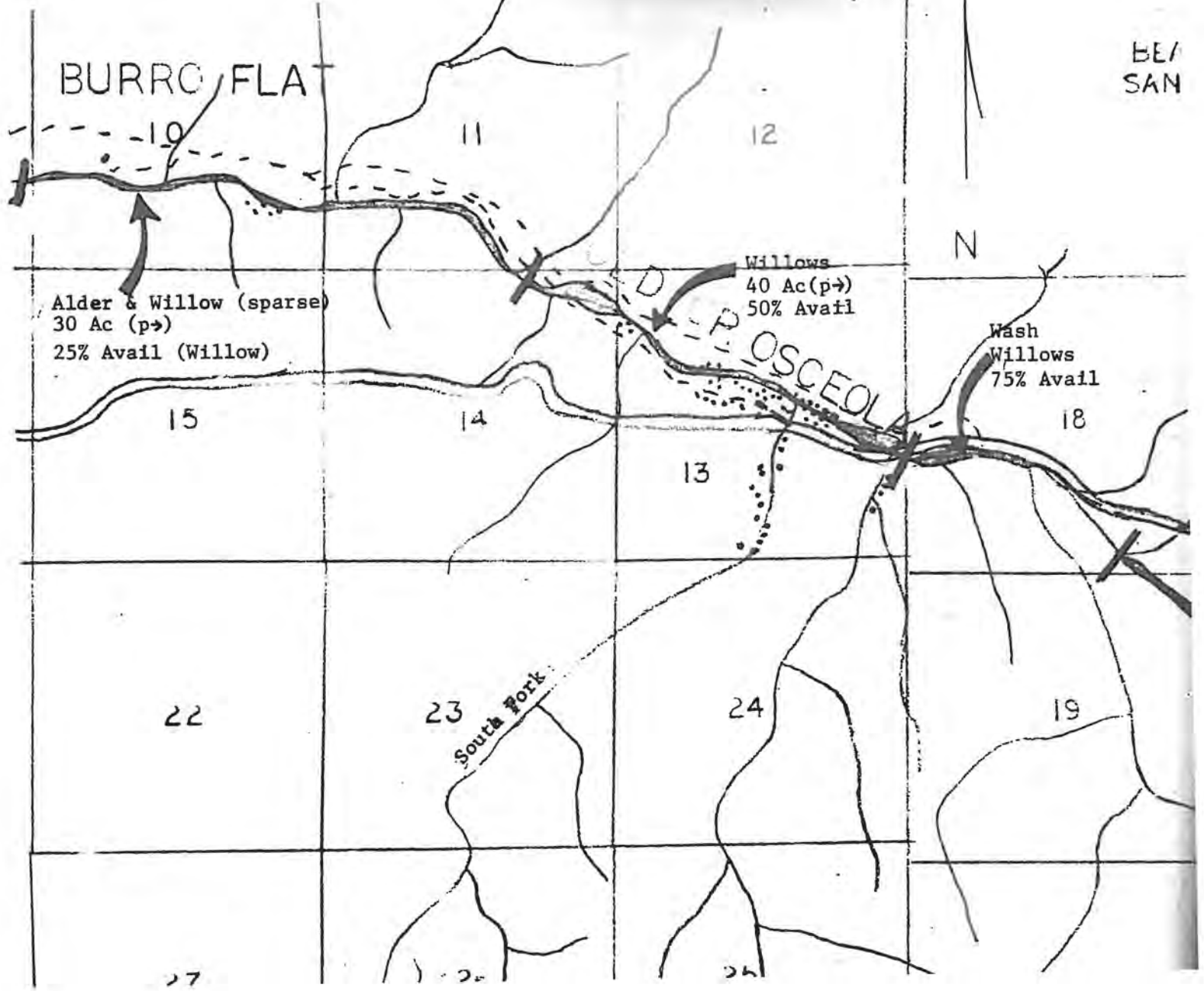
Beaver Dam debris accumulated at high water level.


Beaver Habitat
Upper Holcomb Creek
27
26
25
30
N
A-29
33
34
35
36
Holcomb
Valley
31
Willow
42 Ac(F→)
75% Available
4
1968-JTL

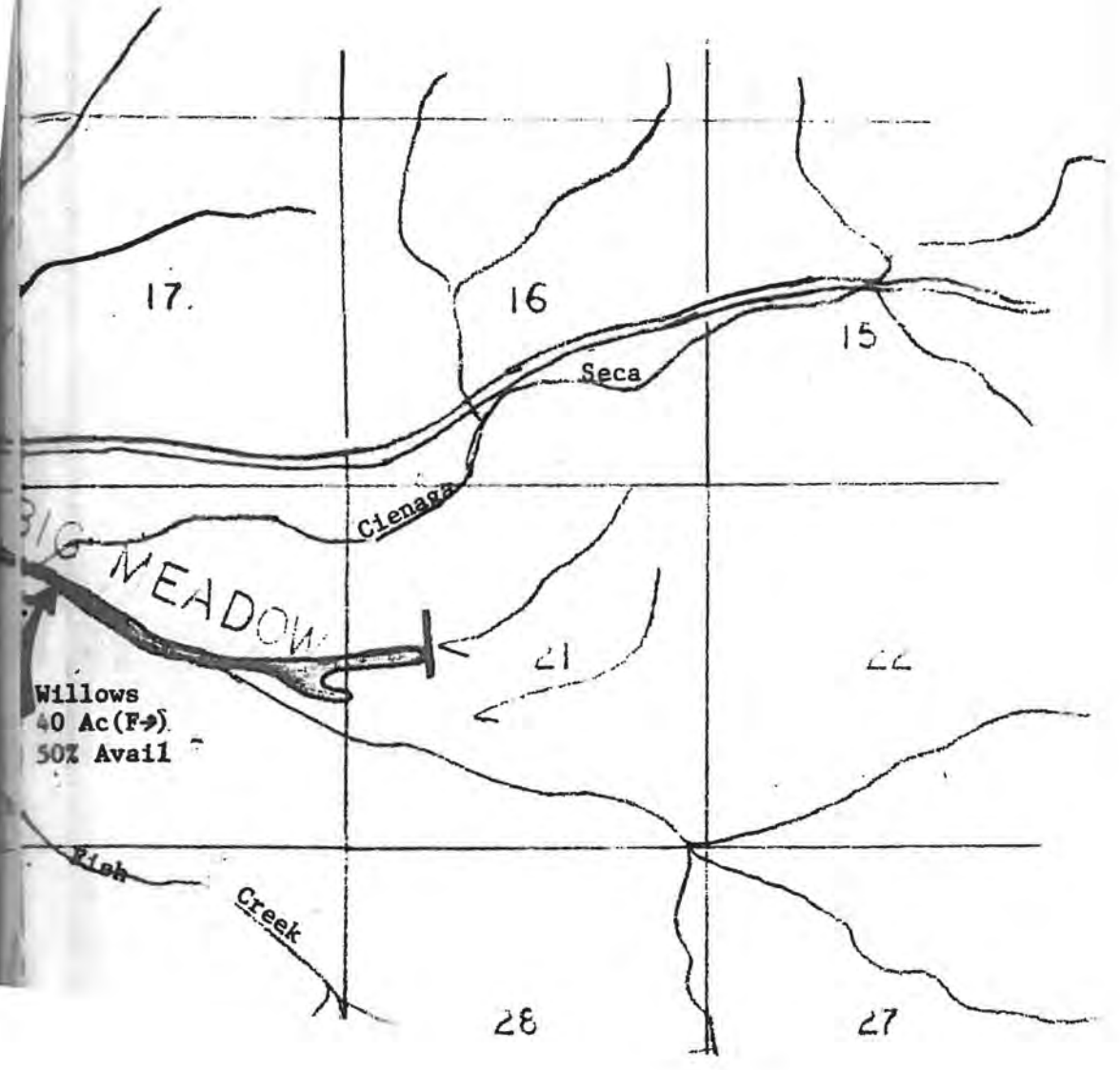

31
32
33
34
35
Devil's Hole Creek
A
Willow-Alder
60 Ac(p→)
25% Avail
5
4
3
2
Holcomb
B
Willow-Alder
28 Ac(p→)
50% Avail
Rock & Alder
Creek
3N
A-30
8
9
10
11
3N16
Deep
18
17
16
15
14

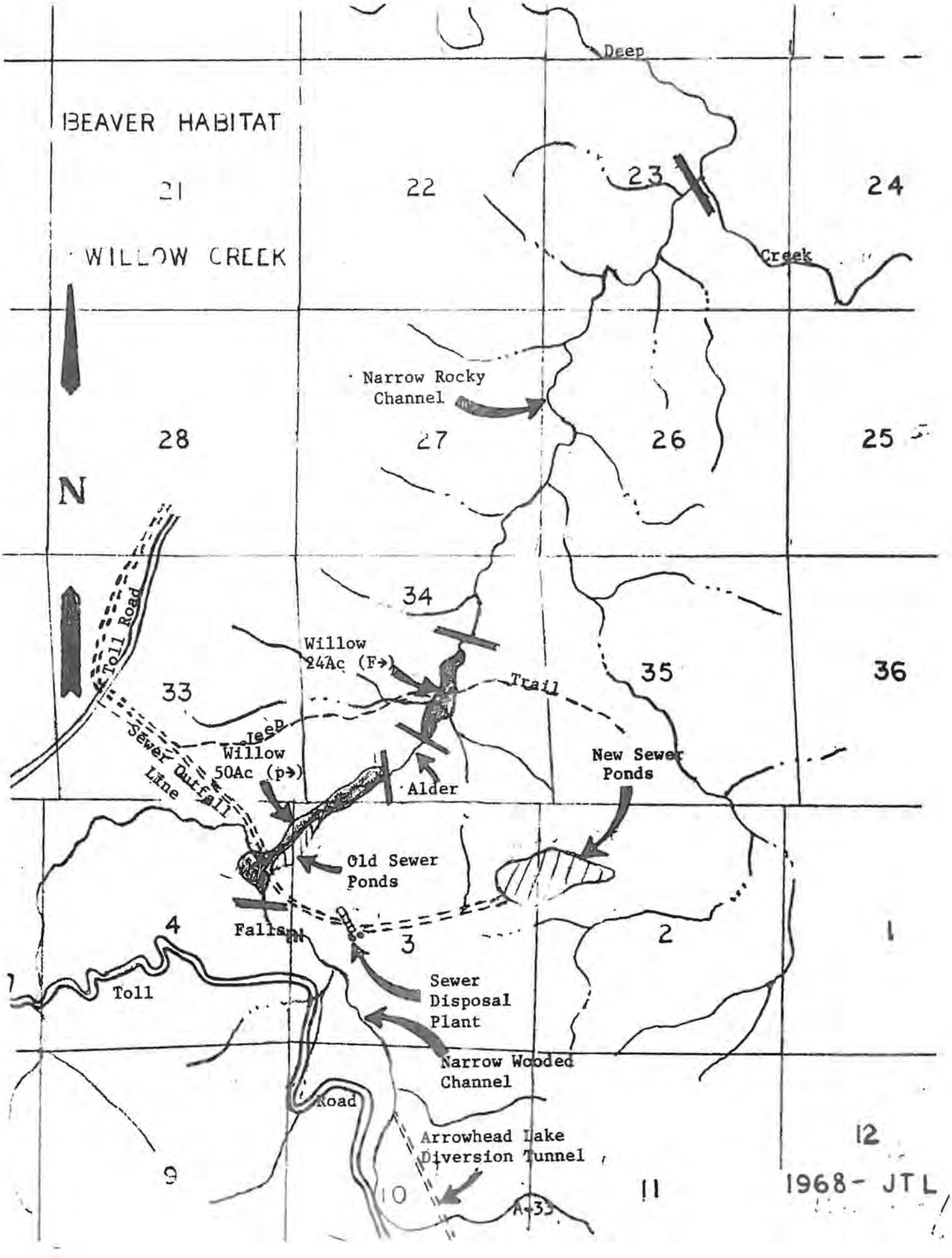

31
32
33
34
6
5
4
3
2
7
8
9
13
17
C
Willow-Alder
60 Ac(p)
50% Avail
Hanna Flat
BEAVER HABITAT
LOWER HOLCOMB CREEK
N


16
15
14
13
18
Luna Mtn.
Willow
22 Ac(p→)
25% Avail
Luna Canyon
Springs
Hot Spring
Willow
15 Ac(p→)
50% Avail
LUNA
Willow
48 Ac(p→)
50% Avail
21
22
23
24
19
BEAVER HABITAT
LOWER DEEP CREEK
Creek
Canyon
27
26
25
30
Willow
Willow
30 Ac(p→)
25% Avail
Mill Creek
A-31
N
Squints
Ranch
34
35
36
31
Willow
45 Ac(p→)
25% Avail
Mallory
Devil's
Hole
1968-


BURRO FLA
10
11
12
N
Alder & Willow (sparse)
30 Ac (p→)
25% Avail (Willow)
Willows
40 Ac(p→)
50% Avail
Wash
Willows
75% Avail
15
14
13
18
22
23
24
19
South Fork

HABITAT
ANA RIVER




BEAVER HABITAT
21
22
23
24
WILLOW CREEK
Deep
Creek
Narrow Rocky
Channel
28
27
26
25
N
34
Toll Road
Willow
24Ac (F→)
Trail
33
35
36
Jeep
Sewer Outfall Line
Willow
50Ac (p→)
Alder
New Sewer
Ponds
Old Sewer
Ponds
Falls
4
3
2
1
Toll
Sewer
Disposal
Plant
Narrow Wooded
Channel
Road
Arrowhead Lake
Diversion Tunnel
9
10
11
12
A-33
1968- JTL